ALCOHOL USE ACROSS THE LIFE COURSE

A Critical Review of 70 Years of International Longitudinal Research

Kaye Middleton Fillmore

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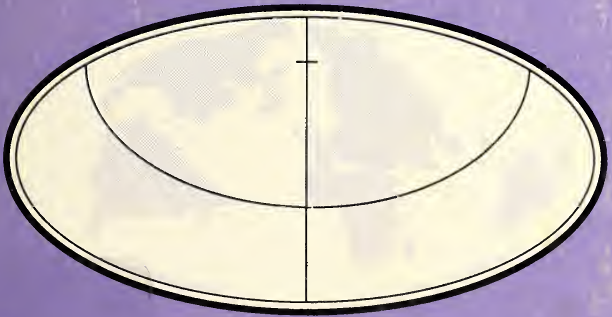

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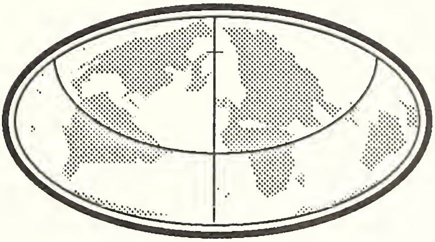

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A Critical Review of 70 Years of International Longitudinal Research

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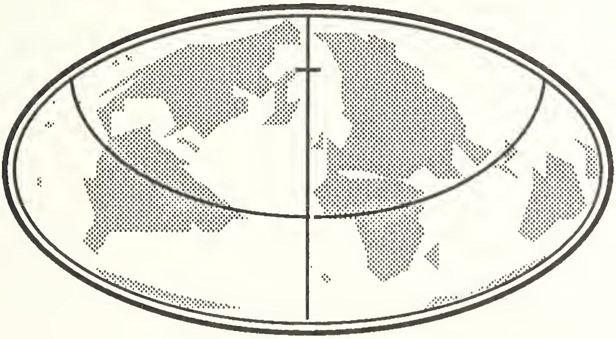

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Canadian Cataloguing in Publication Data

Fillmore, Kaye Middleton, 1941-
Alcohol use across the life course

Bibliography: p.
ISBN 0-88868-163-1

1. Drinking of alcoholic beverages - Longitudinal studies. 2. Alcoholism - Longitudinal studies.
I. Addiction Research Foundation (Ont.).
II. Title.

HV5035.F54 1988 362.2'92'072 C88-093803-X

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Foreword

International concern about the magnitude of the health and social problems associated with alcohol abuse has increased greatly in recent years. In many countries, there is a new sense of urgency about the need to develop coherent policies and programs to deal more effectively with these problems. But good policies need to be based on the best available evidence. Too little attention has in the past been devoted to bringing together what we know about how drinking patterns emerge and change over time. The results of longitudinal studies of alcohol use in particular cultures have provided glimpses of how much we can expect to learn from such data, but it has never been clear how far it is possible to generalize beyond the study samples.

In the summer of 1984, a meeting was held in Geneva of a task force convened by the World Health Organization Advisory Committee on Medical Research's subcommittee on biobehavioral science and mental health. One of the strongest recommendations of that meeting was that WHO should commission a critical review of longitudinal studies of drinking patterns and alcohol-related problems. It was thought that such a review could both yield useful information in its own right and help to provide a sound basis for the conduct of such studies in the future. Acting on that recommendation, I contacted Dr. Kaye Fillmore early in 1985 and invited her to undertake such a review.

At that time, although we were both convinced of the importance of the task, neither she nor I had any idea of its magnitude. It is a tribute to her scientific integrity, as well as her stubbornness, that instead of proposing that the scope of the review be restricted in some way, she actually expanded it into the truly comprehensive critical appraisal of the world literature that is summarized in this monograph. A lesser scientist than Dr. Fillmore might have been content to amass the studies, sift the evidence, and extract some common themes of interest to WHO from a cross-cultural perspective. As a reading of this monograph will make clear, however, this was for her only a preliminary step. She does, certainly, draw out themes which have direct relevance to the planning of policies and programs to reduce the adverse health and social consequences of alcohol abuse. By looking simultaneously across the life course of individuals and across the cultures in which those individuals are living, Dr. Fillmore has been able to highlight social, psychological and biological factors that may be critical in planning prevention and treatment responses to alcohol problems. Already, the analysis contained in this monograph represents a consolidation of research results in a form previously unavailable. Already the implications of these results are of considerable international importance from a public health perspective.

But Dr. Fillmore has done much more than that. Whilst recognizing the limitations and methodological flaws inherent in some of the studies, she has synthesized from the data an approach which will allow the unrealized potential of *all* the studies to be exploited, both individually and collectively. The combination of rigorous attention to detail and an imaginative reconceptualization of the parameters of what longitudinal studies can reveal, has resulted in the generation of an entirely new set of questions. This monograph is, therefore, in a sense only the first chapter. In it, Dr. Fillmore sets the scene for a vastly more ambitious undertaking with an equally vast potential for enlarging our understanding of the relationship between people and alcohol over time. She has now gathered around her a small group of talented scientists, to continue this work through a collaborative longitudinal project utilizing meta-analytic research techniques. I, for one, am confident that she will emerge with something which will be incomparably greater than the sum of its parts.

Marcus Grant
WHO, Geneva, March 1988

Preface

Preparation of this report was sponsored by the World Health Organization and was also made possible by a National Institute of Alcohol Abuse and Alcoholism Research Scientist Development Award (1 KO2 AA 00073-01A1). I am grateful to Andrea Mitchell and Judith Lubina whose library work brought together this body of literature and to Mark Temple, Ronald Stall and Robin Room for their critical comments on the first draft of this manuscript. I owe special thanks to Marcus Grant of the World Health Organization who entrusted me with this project and for his support in work resulting from it and to Aassen Jablensky, also of WHO, who contacted scholars worldwide in search of alcohol-related longitudinal research. Without Anne MacLennan of the Addiction Research Foundation, who persisted in pursuing the publication of this work, it would have remained a report. The expertise of Barbara Fulton, Lia Hatashita and Donald Murray, all of ARF, in the editing, production and design of the publication has been indispensable. My deepest appreciation is extended to members of my family — Richard, Matthew, Steven and an assortment of family pets — who tripped over piles of paper in the dining room while the material was being researched.

This work is dedicated to Selden D. Bacon, my mentor, friend, and most severe critic.

K.M.F.

Chapter 1.

INTRODUCTION AND METHODOLOGICAL CONSIDERATIONS

RATIONALE AND RESEARCH STRATEGY

This review of longitudinal studies of drinking patterns and alcohol-related problems was commissioned by the World Health Organization (WHO) to evaluate the contributions, needs and limitations of longitudinal research. Another aim was to develop guidelines and recommendations for future longitudinal studies of human alcohol use in different regions of the world.

While WHO originally commissioned a report of alcohol-related longitudinal research on adolescents, the review has been broadened to include a collection of such research over the life span, the rationale being from two sources.

First, existing epidemiological (and longitudinal) evidence strongly suggests that the use and abuse of alcohol varies greatly (a) by age (e.g. in the U.S., see Cahalan, Cisin and Crossley, 1969 for cross-sectional evidence; Donovan, Jessor and Jessor, 1983, Fillmore, 1986 or Fillmore, Bacon and Hyman, 1979 for longitudinal evidence) and (b) by culture and history (e.g. see Roizen, 1981 for cross-cultural findings; and Levine, 1978, for historical evidence). Second, there is growing interest in the entire life cycle as a unit of study. Regarding psychological interests, Neugarten (1979) states that:

> ...it is no longer sufficient to say that 'the Child is father of the Man,'[1] momentous as that discovery has been. We say, instead, that psychological change is continuous throughout the life cycle and, further, that the psychological realities of adulthood and aging are not to be understood merely by projecting forward the issues that are salient in childhood (p. 887).

Neugarten's statement is especially pertinent to the study of alcohol patterns and problems where there is much variation across age groups. Since longitudinal studies of virtually every age group exist, our understanding of alcohol use and abuse over the entire life course should be enriched.

---

[1] *My Heart Leaps Up*, William Wordsworth, 1770-1850.

A basic research interest of WHO is cross-cultural studies to determine to what degree individual societies and historical periods are culture-bound. Findings from those which are not can more accurately guide policy formulations for other cultural and historical settings as well. The basic research interest of longitudinal studies has traditionally been in maturation (aging). An integration of these two research interests compels us to assess the degree to which maturational findings can be replicated across history, culture and age cohort.

While integrating these two research interests is valid (not only for policy formulation but for science, where generalization of results is critical), it is important to note that the objective cannot be met. Rather, the review (a) determines what longitudinal studies exist in the world (which can later be applied to systematic and meaningful cross-cultural and cross-temporal comparisons), (b) locates important findings from this literature which should be subjected to cross-cultural and cross-temporal comparisons and (c) suggests strategies to facilitate these objectives.

It is important to note that this review suffers from a particular difficulty. While literature reviews are typically concerned with a substantive question, this review is organized around a research tool which has addressed a *variety* of research questions about alcohol use and abuse. Therefore, the relative merits or contributions of each of the longitudinal studies will not be argued. Rather, the first major segment of the report takes a chronological look at the subject–the emergence and decline of various research questions, the age cohorts and types of samples studied and the emphases on both dependent and independent variables. The varying themes of research in different historical periods will be pointed out along the way. Attention will also be paid to the methodological problems inherent in longitudinal research, and the innovations in longitudinal design, which have emerged over time, will be noted.

The final two major segments of the report draw from the knowledge derived from the historical review. We identify the lack of cross-study comparison to epidemiological description and propose, and crudely demonstrate, ways in which individual longitudinal studies can powerfully contribute to epidemiological description across historical periods, cultures and age cohorts. We also closely examine three diverse explanations of longitudinal drinking patterns and problems–from the perspectives of biology, sociology and psychology. We examine how concretely replicated they are and how they are confounded by methodological problems. From there we develop strategies for future research which will more carefully delineate the boundaries of the respective findings. While other perspectives could be examined from the longitudinal literature, these three are specifically addressed because they represent the bases of some contemporary conflict in the alcohol field.

This review is limited in the following respects.

1. Longitudinal alcohol research has been confined to the 20th Century and performed almost solely in Northern European and North American countries. These countries are industrialized and the life span characteristics of their citizens follow a more similar than dissimilar course. Geographical exceptions are a Shetland Island study (Caetano, Suzman, Rosen and Voorhees-Rosen, 1983), a study of coloured adults in the Cape Peninsula of South Africa (Gillis and Stone, 1977), a study of college students in Hong Kong (Bard and Peacock, 1976), a study of adolescents in Israel (Teichman and Rahav, 1986) and a proposed adolescent study in Japan (Kono, 1985). Obviously, the objectives of review would be better met if longitudinal work from non-industrialized or partially industrialized nations was available. Given both the geographical and the historical constraints, it should be understood that, even with replication across countries and age cohorts, current and future comparison of maturational results cannot be generalized with any certainty.
2. Proposals for future study comparisons are faced with the technical difficulty of completely disentangling maturation effects from cohort or historical effects in any research design. Therefore, they must be approached with caution (Riley and Waring, 1978).
3. Only about half of the studies reviewed include female subjects, making life course statements about females less concrete than about males. Most of the studies dealt almost exclusively with white males thereby limiting knowledge about other ethnic groups.
4. The longitudinal research reviewed here does not include follow-up studies of diagnosed or treated alcoholics. These studies are so

numerous they require their own special reviews.

5. The mortality and morbidity literature is scantily treated, partly because treated alcoholic samples are excluded.
6. Operational definitions across studies differ markedly (e.g. consumption measures, "problem drinking," treated and untreated alcoholism, arrests for drunkenness). This is particularly true across age groups (e.g. problem drinking definitions are typically used to assess adolescent problems whereas problem drinking, alcoholism or alcohol dependence definitions normally characterize adult samples). While these differences make assessment of the degree of replication difficult, such a variety of operational definitions is a product of historical development in the field and the diversity adds to, rather than subtracts from, an analysis of the variability of alcohol use and abuse in the life course.

Methodological Considerations

Longitudinal studies can address several basic research questions. They can seek to (a) determine the antecedents of particular behaviors, (b) assess and describe the incidence or chronicity/remission of behaviors and their correlates and (c) differentiate in the timing of antecedents and correlates of given behaviors (Clausen, 1978). For alcohol use and abuse, longitudinal studies are the basic epidemiological tool to explore specific hypotheses regarding the relative probabilities of who does and does not encounter problems (whatever the definition of problems may be) and to describe the processes and mechanisms for developing problems with alcohol.

Longitudinal research using normal representative populations is especially ideal (a) for determining the incidence and chronicity of drinking patterns and problems, (b) for assessing social change as it affects individuals, (c) for describing the "normal use" of alcohol throughout the life span and (d) for determining loss through selective survival and drop-out (the latter being a problem of particular significance for alcohol studies–see Shanks, 1975; Josephson and Rosen, 1978). Longitudinal research with nonrepresentative samples is particularly suited (a) for generating hypotheses, (b) for answering narrow questions within "experimental design" frameworks, (c) for determining short-term changes in diagnoses and (d) for providing sufficient "deviant cases" for analyses (Mednick, 1981).

The longitudinal studies reviewed here use normal populations and specific non-representative special ones. Because longitudinal design addresses diverse issues in the alcohol field, an historical review shows that the designs of existing longitudinal research have become diverse and imaginative.

The traditional longitudinal research design measures a sample at one point in time (Time 1) and at some later point(s) remeasures it (Time 2 through Time X). These kinds of studies may describe alcohol use over time within one or more theoretical frameworks (e.g. Lerner and Vicary, 1984; Vaillant, 1983). The traditional longitudinal research design also can evaluate natural or contrived experiments which involve environmental change and come closer to experimental design if appropriate controls are utilized (e.g. Caetano et al., 1983; Giesbrecht and McKenzie, 1983).

Since the 1920s and 1930s, longitudinal alcohol research (as well as longitudinal studies in general) have deviated from this basic design. Some have measured overlapping normal representative birth cohorts over time to assess the degree to which there are cohort or historical effects and to make statements about longer periods in the aging process without sacrificing the time it would take to perform the traditional longitudinal study (e.g. Lester, Pandina, White and Labouvie, 1984, on sequential age cohorts of adolescents). Other designs have collected data on individuals displaying a behavior or condition, matching on presumptively relevant variables to create a control group, and then assessing records from the past in an effort to distinguish between the two groups (e.g. Kammeier, Hoffman and Loper, 1973). Still other designs have selected cases from past records (usually with the relevant controls) and worked forward (e.g. Bohman, Sigvardsson and Cloninger, 1981, on the children of alcoholics, or Kaij and Dock, 1975, on the grandsons of alcoholics). The last two designs short cut the research process while retaining the time element. However, they are limited by being typically confined to using available records. Such studies are most usually done in countries where extensive records are kept on the population as a whole and where the records are also accessible to researchers (e.g. Denmark and Sweden).

The limitations and difficulties of longitudinal research have been widely discussed (e.g. Baltes, 1968; Mednick, 1981) and will only be mentioned in passing here. Reference to specific problems will be made in the discussion of some individual studies. The limitations include, of course, financial considerations (especially with respect to traditional designs), administrative continuity, unanticipated population changes, "sleeper effects" (e.g. no effects showing at a particular age of measurement but manifesting themselves at a later age), measurement effect, selective survival and drop-out, tracing problems, complex statistical techniques, and scant attention paid to cohort and historical effects.

However, the contributions of longitudinal studies are potentially well worth the costs. This is especially true in the alcohol field where the longitudinal design can shed light on the under-studied and little understood issues of incidence, chronicity and remission. The longitudinal design can clarify diagnostic criteria which may distinguish between long- and short-term alcohol problems in reference to age and stage in life. Further, it can disentangle biological, social and personality characteristics (and their respective potential interactions) which hypothetically contribute to the incidence, chronicity and remission of alcohol problems. Longitudinal research has provided findings which have changed the research questions asked in the field. Furthermore, longitudinal assessments and descriptions of alcohol use in the life course within given societies may more thoroughly lay the groundwork for future cross-cultural comparisons which, in turn, may be critical for prevention and intervention strategies.

Chapter 2.

AN HISTORICAL OVERVIEW

In this chapter, the history of alcohol-related longitudinal research since the 1920s will be described to show changing conceptual interests, the age cohorts and sample types studied, emphases in dependent variables and methodological innovations.

Figure 1 (p. 9) displays the studies according to decade the study was initiated and by the ages the subjects were measured. Studies in the first segments of Figure 1 include only those for which data have been collected at two or more points in time (mortality studies not included). Studies in the last segment include those in which follow-ups are anticipated. Studies initiated within each decade are broken into three types: (a) limited age cohorts (i.e. persons born within one to ten birth years, usually drawn from the general population), (b) multiple birth cohorts (i.e. usually studies of the adult general population) and (c) special populations, regardless of number of age cohorts (i.e. typically describing groups drawn for special reasons– children of alcoholics, children in treatment, difficult children, gifted children, handicapped groups). Each study is coded by a variety of methodological considerations (e.g. probability methods, inclusion of both sexes, and the general sampling frame). Next, a rough code is applied to the major emphases of the independent or explanatory variables and, last, to the alcohol measures used as dependent variables. Codes for both independent and dependent variables may be multiple; that is, the categories are not mutually exclusive. For instance, a social-psychological framework may integrate when drinking begins with patterns of use over time which would predict a measure of alcohol consumption and a measure of problem drinking.

BEFORE THE 1950s: "THE CHILD IS FATHER OF THE MAN"

Studies prior to the 1950s were characterized by limited birth year cohorts and special population studies. Reflective of psychological and sociological methodology at that time, the limited birth year cohort studies made no attempt to generate samples representative of the group studied (the exception being Fillmore et al., 1979, based on Straus' and Bacon's 1953 study of college students, where a partial attempt was made). The limited birth year cohort studies included a young white middle-class sample (Block, 1971; Jones, 1968, 1971) and two college samples (one of Harvard students–Beardslee and Vaillant, 1984, Vaillant, Brighton and McArthur, 1970, Vaillant, 1984; one of a national sample–Fillmore, 1974, 1975, Fillmore et al., 1979).

While the special population studies included samples to study the development of gifted children (Oden, 1968) and adopted children (studied as adults) to assess the effect of the biological fathers' alcoholism (Roe, 1944), the major interest of such research during this period was with childhood and adolescent problems–deviant children (Robins, 1966; Robins, Bates and O'Neal, 1962), inner city youth (Vaillant, 1983, 1984; Vaillant and Milofsky, 1984; Vaillant, Gale and Milofsky, 1984), children in treatment for behavior problems (Monnelly, Hartl and Elderkin, 1983) and difficult boys (McCord, 1972, 1984; McCord and McCord, 1960, 1962). Generally speaking, these studies focused on locating deviant or pathological personalities in children, particularly boys (the Robins' data being the exception), and deviance or pathology in the home environment–both of which would hypothetically account for various ills in adulthood, alcohol problems included.

Alcohol use was rarely the primary focus of these studies; however, deviant alcohol use (measured by concepts of alcoholism) was embedded in many measures of psychopathology which early personality and environment were expected to explain. Only the Straus and Bacon study (Fillmore et al., 1979) and the Roe study (1944) were alcohol-specific, speaking to the emerging post-Prohibition interest in alcohol studies in the U.S. When alcohol was assessed, it was typically conceptualized as "alcoholism" and the measures were derived from existing records of treatment and psychi-

FIGURE 1

Decade Study Commenced by Age of Measurement

DECADE STUDY COMMENCED	AGES OF MEASUREMENTS

1920s-1930s

LIMITED BIRTH YEAR COHORTS

Jones/Block (U.S.-middle class)+,a,A, B,H,G,1,4	x——x——x——x 10 33 38 43
Valliant (U.S.-Harvard students)c,A,F,H G,I,1,4	x——x——x——x 18 31 47 59

SPECIAL POPULATIONS

McCord & McCord (U.S.-“difficult” boys) A,B,1,5	x——x——x 5-11 30s
Robins et al. (U.S.)+,j,D,A,B,1,4	x——————x 13-14 46
Monnelly (U.S.)j,I,D	x—x—x——x——x under 16 over 60
Oden (U.S.-gifted)+,b,D,2,4	x—x—x—x—x—x——x 6-18 46-58

FIGURE 1 (Contd.)

1940s

LIMITED BIRTH YEAR COHORTS
Fillmore, Bacon & Hyman/Fillmore x——————————x
(U.S.)#,+,d,H,G,3,4 16-25 43-52

MULTIPLE BIRTH YEAR COHORTS
Gordon & Kannal T1:x——————————x
(U.S.)#,+,f,F,4 29 62
T2:x————x
49+

SPECIAL POPULATIONS
Roe x——————————————x
(U.S.)+,k,C, Birth 22-40
4,9

Valliant/Beardslee & x————x—x———x
Vaillant(U.S.-Inner city 16 47
boys)a,A,H,G,1,3

1950s

LIMITED BIRTH YEAR COHORTS
Fogelman & Wedge x———x—x—x———23
(Eng., Scot., Birth 7 11 16
Wales-birth
cohort)*,+,H,F,4

Klackenberg xxxxxxxxxxxxxxx
(Sweden-birth Birth 18
cohort)*,+,D,2

FIGURE 1 (Contd.)

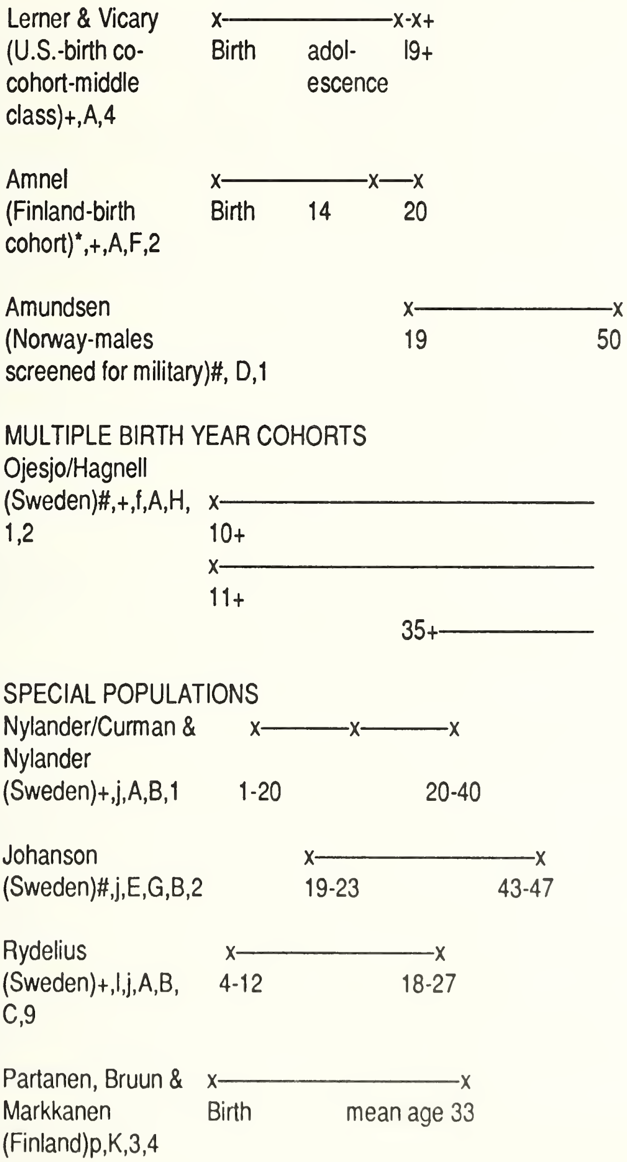

Lerner & Vicary (U.S.-birth co-cohort-middle class)+,A,4
Birth
adolescence
19+
Amnel (Finland-birth cohort)*,+,A,F,2
Birth
14
20
Amundsen (Norway-males screened for military)#, D,1
19
50
MULTIPLE BIRTH YEAR COHORTS
Ojesjo/Hagnell (Sweden)#,+,f,A,H, 1,2
10+
11+
35+
SPECIAL POPULATIONS
Nylander/Curman & Nylander (Sweden)+,j,A,B,1
1-20
20-40
Johanson (Sweden)#,j,E,G,B,2
19-23
43-47
Rydelius (Sweden)+,l,j,A,B, C,9
4-12
18-27
Partanen, Bruun & Markkanen (Finland)p,K,3,4
Birth
mean age 33

FIGURE 1 (Contd.)

1960s

LIMITED BIRTH YEAR COHORTS

Kellam et al. (U.S. black urban)#, +,a, A,4	x————x 6-7 16-17
Pulkkinen (Finland)#,+,A,D,4	x——x————x 8 14 20
Farrington & West (Eng.-urban working class)*,a,A,3,4	x-x-x-x——x 8-9 21
Jessor & Jessor/Donovan (U.S.) #,+,a,D,G,E,7,3	x——x———x 12-14 22-24
Nuttal & Nuttal (Puerto Rico)#,+,a,D,4	x————x 12-14 19-21
Brunswick (U.S.-urban blacks)#,+,i,K,10	x————x 12-17 21-24
Bruun (Scandinavian urban areas)#,b,G,E,7,4	x——x 14 18
Bachman & O'Mally; Johnson (U.S.)#,e,H,J,4,7	x—xxx——x 15 23
Zucker & Defoe (U.S.)#,+,A,D,3,4	x—x 15-16 17-18
Temple & Fillmore (U.S.)#,a,G,D,4	x-xxxxxxxxxx—x 16 31

FIGURE 1 (Contd.)

Campbell/Britt & Campbell x——x
(U.S.)#,+,b,H,J,7 17-18 19-20

Alexander & Campbell x———x
(U.S.)#,+,d,H,7 17-18 21-22

Robins et al./King et al. x——————x
(U.S. urban blacks)a,A,B,H under 18; born evaluated
G,1,4 in 4 yr. period 18-35

Maddox x—x
(U.S.-black college)#,c,H,7,4 mean 19 mean 20

Garfield & Garfield x—x
(U.S.)*,+,c,G,4 18-21 19-22

Kammeier et al./Loper et al. x——————x
(U.S.)c,A,1 mean age 20 mean age 33

MULTIPLE BIRTH YEAR COHORTS
Gillis & Stone T1 20 x——————————x
(South African Coloured)#,+,f,G,2,4 T2 26 x——————————x

Room/Williams/Fillmore & T1 21 x——————————x 59
Midanik(U.S.)#,+,f,G,D,4,3 T2 24 x——————————x 62

Cahalan T1 21x——————————x 59
(U.S.)#,+,f,G,3,4 T2 24 x——————————x 62

Roizen, Cahalan & Shanks/
Clark & Cahalan/Clark/ T1 21 x——————————x 59
Fillmore & Midanik(U.S.)#,f,G,3,4 T2 25 x——————————x 63

Stall
(U.S.)#,f,G,3,4 " " T3 59+

FIGURE 1 (Contd.)

Cahalan/Room (U.S.)#,+,h,H,D,4,3	T1 21 x——x 70 T2 24 x——x 73
Cahalan & Roizen (U.S.)#,h,G,3,4	T1 21 x——x 59 T2 25 x——x 63
Glynn et al./Bosse et al. (U.S.)f,G,H,4,3	T1 21 x——x 81 T2 28 x——x 87 T3 40+——x
Ekholm (Finland-20 data points in 1 yr)f,G,4	T1 23 x——x 54 T2 24 x——x 55
Simpura & Poikolainen	" " 42+——
SPECIAL POPULATIONS	
Bohman & Sigvardsson (Sweden)#,+,k,B,C,2	x—x—x——x Birth 22
Butler & Friedman (U.S.)#,+,i,f,E,G,4	x——x Birth-5 12-17 x——x 9-15 20-26 x——x 36+ 50+
Rydelius (Sweden)+,m,A,B,D,6	x——x mean 15 mean 20
Rydelius (Sweden)#,m,A,B,6	x——x 16 21
Goodwin et al. (U.S. felons)n,A,D,1,4	x——x mean 26 mean 34
Martin, Cloninger & Guse (U.S.)+,n,G,1	x——x mean 29 mean 34

FIGURE 1 (Contd.)

Medhus x———x—x
(Sweden)+,n,G,10,6 mean 38

1970s and early 1980s

LIMITED BIRTH YEAR COHORTS
Casswell x—–x—–x—–x
(New Zealand) Birth 9 11 13
#,+,i,D,4,7

Grube & Morgan x———x
(Ireland)#,+,a,D,3,4,8 11-19 12-20

Ostrihanska & Wojcik x——x
(Poland)+,r,D,C,9 12-13 16-17

Coombs et al. x—x-x
(U.S.-Anglo & Hispanic)+,i,G,4 12-17 15-20

Jessor, Donovan & Widmar x——x
(U.S.)#,+,e,E,3,4

Kaplan & Porkorny, xxx
(U.S.)#,+,a,A,4,3 12 14

Huba & Bentler/Huba et al. x-xxxxx
(U.S.)#,+,a,G,4 12-14 16-18

Lester et al. x-x
(U.S.)#,+,i,D,F,G,3,4 12 15
x-x
15 18
x-x
18 21

FIGURE 1 (Contd.)

Silbereisen (Germany & Poland) #,+,a,D,E,4	x-x-x 13 14 15
Teichman (Israel)#,+,b,D,4	x—x 14-17 15-18
Kandel et al./Margulies et al. Yamaguchi et al. (U.S.)#,+,b,D,E,G,7,4	x——x 14-17 15-18
	x-x " " 18-19
subsample	x————x 15-16 24-25
Plant et al. (Scotland)#,+,a,D,4	x—x 15-16 18-19
DiTecco & Schlegel/Schlegel et al. (Canada)#,+,b,D,3,4	x————x 15-18 19-22
Crowley (U.S.)#,+,e,D,3,4	x————x 17-26 24-33
Jessor & Jessor (U.S.)#,c,D,G,E,7,3	xxx————x 18 25
Mellinger et al. (U.S.)#,c,A,H,4	x———x 18-19 20-21
Sieber & Angst (Switzerland)#,i,D,4	x———x 19 22
Hashway et al. (U.S.)#,+,a,D,4	x—x 18-21 ?

FIGURE 1 (Contd.)

Greenfield & Duncan (U.S.)#,+,c,J,H,3	x-x-x 18-20s 20-late 20s
MULTIPLE BIRTH COHORTS	
Klatsky et al. (U.S. medical exams in HMO)+,G,4	T1 15+ T2 to TX: ongoing
Caetano et al. (Shetland Islands)#,+,h,J,4	T1 15 x————————x 60 T2 19 x————————x 64
Kendell et al. (Scotland)#,+,i,J,3,4	T1 17 x————————x T2 20 x————————x
Bergsveinsson/Helgason (Iceland)#,+,f,D,3,4	T1 20 x————————x 49 T2 25————————x 54
Menaghan et al. (U.S)*,#,+,f,H,D,J,9,4	T1 20+ x————————x T2 24+ x————————x
Homel (Australia - 6-week follow-up) #,+,S,J,12	T1 licensed drivers T2 " "
Hingson et al. (U.S.)#,+,f,D,H,3,4	T1:"adult sample" T2: " "
Ameshensel & Huba (U.S.-4 data points in 1 yr)#,+,e,A,4	T1: "adult sample" T2: " "
SPECIAL POPULATIONS	
Cadoret et al. (U.S.)#,+,C,A, H,1	x————————x Birth mean 25

FIGURE 1 (Contd.)

Goodwin et al. (Denmark)+,k,F,C,1,3	x————————————x Birth mean 30s
Cloninger et al./ Bohman/Bohman et al. (Sweden)+,k,F,H,D,2	x————————————x Birth 23-43
Crowe (U.S.)+,o,B,1	x———————————————x Birth 45
Schuckit & Chiles/ Morrissey (U.S.)+,j, A,B,C,1,3,4	x———? mean 17
Robins /Wish et al./Goodwin et al. (U.S. Veterans)G,D,3,4	x–x mean 20 mean 21
Plant (Scotland-2 occupational grps.)	T1 20x———40 T2 21x———41
Hesselbrock et al. (U.S.)+,l,F,D,4,1	x—x mean 24 mean 28
Kaij & Dock (Sweden-grandsons of alcoholics born 1870- 1887)I,C,1,6	x—————————x Birth 15-55

Follow-ups planned for the future

SINGLE BIRTH YEAR COHORTS

Moberg et al. (U.S.)#,i,D,2	x————? teenagers

FIGURE 1 (Contd.)

MULTIPLE BIRTH YEAR COHORTS

Korczak (Germany)#,+,g,D,H,J,3,4	x—x———?	14-49 16-51
Kubicka (Czechoslovakia)#,f,D	x—x	22-33 26-37
Wilsnack & Wilsnack (U.S.)#,+,h,D,3,4	x—x	adult women
Giesbrecht & McKenzie (Canada-intervention study pre & post measures)#,+,g,H,4	x—————?	adults
Robins & Przybeck (U.S.-Ecological Catchment Areas)#,+,g,A,D,C,1,4	x—x	18+ 21+

SPECIAL POPULATIONS

Zucker et al. (U.S.)I,F,A,D,1,4	x———?	4
Begleiter et al. (U.S.)I,C,F,1,11	x———?	7-13
Hegedus et al. (U.S.)I,F,1,11	x———?	mean 13
Tarter/Hegedus et al. (U.S.)I,j,C,F,1,11	x———?	mean 16
Schuckit/Schuckit & Rayses (U.S.)i,F,C,1,11	x——?	mean 23
Knop et al./Pollock et al. (Denmark)#,C,1,11	x————?	20-22

FIGURE 1 (Contd.)

METHODOLOGICAL CONSIDERATIONS

*	Alcohol data are available, but but findings have either not been analyzed or published
#	At least minimum probability methods used to approach representativeness of group studied
+	Females included in sample
a	School sample; one community
b	School sample; multiple communities
c	One college sample
d	Multiple college sample
e	National school sample
f	Adults; one community
g	Adults; several communities
h	Adults; representative of country
i	Local sample (non-school)
j	Children/adolescents in clinical treatment or incarcerated
k	Adoption sample with controls
l	Children/grandchildren of alcoholics
m	Children/adolescents apprehended for drunkenness
n	Incarcerated adults
o	Children of female offenders
p	twin sample
r	children of alcohol abusers
s	licensed drivers

Emphasis of independent variables

A	Personality traits/psychiatric diagnosis/psychiatric symptoms/ psychological tests
B	Parental personality traits/psychiatric diagnosis/family structure
C	Parental alcoholism
D	Social-psychological
E	Age at initiation of drinking (and other) behaviors

FIGURE 1 (Contd.)

F Biological
G Patterns of use-abuse over time (including age specification)
H Sociological
I Body build
J Situational or environmental impact
K Drug use (including alcohol)

Emphasis of dependent variables

1 Alcoholism
2 Alcohol abuse
3 Problem drinking
4 Alcohol use
5 DWI
6 Arrests for drunkenness
7 Abstention vs. drinking
8 Drug use (including alcohol)
9 Social adaptation/social adjustment
10 Health status
11 Genetic marker
12 Perceptions of risk for driving while drinking and behavior changes

atric interviews. However, during the 1940s a problem drinking index was first used (Straus and Bacon, 1953) which would later be instrumental in laying the groundwork for self-administered tests of diagnosis of alcohol-related problems and measurement of disaggregated problems in large general population samples.

No study prior to 1950 took place outside the U.S. Half of the studies were concerned with explanatory variables of psychiatric diagnoses or personality traits. Three explored biological characteristics–one, physical constitution in youth predictive of alcoholism in adulthood (Monnelly, 1983); a second, a genetic hypothesis among children placed in foster homes (Roe, 1944); and a third, health among adults in a community (Gordon and Kannal, 1983). Four considered sociological explanations.

Last, a major characteristic of these three decades is that the follow-up periods stretched out for many years, some of them for four decades.

The "longitudinal news" published before the 1950s was limited to one study–Roe (1944); the remainder of the studies commencing during this period and during the 1950s were not published until the 1960s or later.

The 1950s–A Decade of Scandinavian Research

During the 1950s decade, 10 longitudinal research projects were initiated. Except for Amundsen's (1982), all the limited birth-year cohort studies consisted of individuals studied from birth until their late teens or early 20s. Three out of four studies were done in Europe (the British Isles, Sweden and Finland), and one in the U.S. All of them were concerned with the development of children and all used many variables and data sources to measure various developmental stages. To our knowledge two of the four never published on alcohol use and abuse although they report that the data are available (Amnell, 1981; Klackenberg, 1981). Recently, alcohol-related data have been reported for a 1958 birth cohort (Ghodsian and Power, 1987) from the National Child Development Study in England (Fogelman and Wedge, 1981). The use of alcohol was a rarely measured variable in the large developmental studies of that period; in fact, these are the only three of 10 mentioned in Mednick and Baert's (1981) collection of prospective birth cohort studies taking place in Northern Europe to contain alcohol-related variables. This points to the general lack of interest in drinking patterns and problems in the larger childhood developmental literature at that time.

Alcohol-related longitudinal studies gained considerable popularity in the Scandinavian countries during the 1950s. Record-keeping in these countries is quite extensive and available to researchers–thereby cutting down the time necessary for longitudinal studies. Two methodologically resourceful studies came out of this environment, illustrating embellishments on the traditional longitudinal design.

Johanson (1981) reported on Swedish youth prison inmates who had been incarcerated in 1928-32 and paroled in the early 1950s (the date of first measurement) and a control group. They were then followed through records into the 1970s. She extended the study to include records of the subjects' parents, spouses and children. This enriched her sample from 128 to 1,500 individuals by 1964 and 2,217 individuals by 1975, with a total time period for some families of 100 years. The analyst initially organized the data using musical scores to gain insight into its exploratory nature. This, by far, was the most imaginative methodological tool turned up by this review.

Amundsen (1982) followed up the entire Norwegian male population given military screening in 1951 at age 19 and is still in the process of locating this entire group (N=15,810) through public records. Analyzing institutional records, he has found that boys most likely to become alcoholic grew up in an urban environment, had low intelligence, were from the lower social class, had divorced parents, exhibited maladjustment in school, were short and were more likely to report drinking to get away from trouble or worries.

The second large community study to examine alcohol use and abuse over many years was the Lundby study in Sweden (Hagnell, 1981; Ojesjo, 1980a, b, 1981a, 1983, 1984; Ojesjo, Hagnell and Lanke, 1982, 1983). While it was initiated in the 1940s, we have placed it in the decade of the 50s when alcohol-related variables were first introduced. The Lundby emphasis was quite different from the Framingham study in the U.S. (Gordon and Kannel, 1983) which also started in the 1940s. The Lundby study employed psychiatric diagnosis as its major measurement, while the Framingham study used physical examinations and questionnaires to examine the correlates and antecedents of cardiovascular disease. Both laid the groundwork for later mortality studies.

Following the interests of earlier generations of scholars, Curman and Nylander (1981) and Nylander (1960a, b) tracked cases registered at a child guidance clinic in Sweden, using psychiatric clinical assessment as the explanatory variables and notations in temperance and criminal registers and hospitalization records to determine the degree of alcohol problems. Among the findings were that the younger the boys' age at discharge from the clinic, the lower the relative risk of registration in temperance registrars. Children at higher risk of appearing in the temperance or criminal registers were more likely to be illegitimate, have a single mother, have come from the lower class and have displayed hyperactivity, aggression and disruption in school.

Rydelius (1981c, 1984) examined the children of alcoholics in treatment, matched with controls, using existing records to follow them for evidence of alcoholism. Children from alcoholic homes were more likely to have been guilty of misdemeanors associated with their own drunkenness and to have engaged in criminal activities by the time they were between the ages of 19 and 27.

Partanen, Bruun and Markkanen (1966) and Kaij (1960) investigated alcohol use among identical and fraternal twins. These studies (with Roe's adoptee study of an earlier decade) laid the groundwork for a contemporary interest in disentangling nature from nurture in the development of alcohol problems.

Common threads running through all of these studies are their Scandinavian origin and the extensive use of records. While using records has the definite advantages of short-cutting the research process and being relatively inexpensive, there is the distinct disadvantage of false positives and no record of false negatives. In other words, while some individuals may be classified by an institution as alcoholic it cannot be ascertained whether this is an appropriate diagnosis; other individuals may be alcoholic or experience alcohol problems without ever being included in the society's institutional records. Ojesjo (1980b), being sensitive to this matter and having at his disposal both interviews as well as records, demonstrated that the Swedish public records contained only 70% of those alcoholics diagnosed by clinical interview, suggesting an under-estimation of this population in the Swedish studies using public documents.

The 1950s studies, with few exceptions, continued to focus on populations in which either the parents or the child had appeared at the doors of some institution. One exception was a study initiated in the U.S. (Lerner and Vicary, 1984) which measured a cohort of children from birth (in 1956) to age 19. This study found that early measures of "difficult temperament" were significantly related to tobacco, alcohol and marijuana "severe use" at age 19.

Probably the most impressive fact about the longitudinal studies conducted between the 1920s and the late 1950s is the years of devotion and hard work many of them represent. Computers were not available or accessible until the mid to late 1950s nor were there data collection agencies. Longitudinal studies, in many ways, were "a seat of the pants" operation. For instance, in the Lundby study, Hagnell personally interviewed the entire population–numbering thousands of individuals–in 1957, locating almost 100% of the originals. Data analysis involved tedious hours of either shuffling paper or standing at some version of the counter sorter (itself now almost an antique). Straus and Bacon [personal communication] said that for their cross-sectional report students were stationed around the clock to feed thousands of cards through the counter sorter. In these respects, every subject interviewed, every chi square and every contingency table should be deeply appreciated by those of us who inherit the work of these early published studies.

THE 1960S: DRUG USE AMONG ADOLESCENTS AND GENERAL POPULATION ADULT SURVEYS CHANGE THE FACE OF LONGITUDINAL RESEARCH

The 1960s brought a rebirth of interest–certainly in the U.S.–in the value of studying human beings over time. Of the 32 studies initiated (a number more than doubling those performed in the previous four decades), the majority were American.

Several inter-related events occurred during this decade which challenged the then current assumptions prevalent in the alcohol field and changed the face of alcohol-related longitudinal research as well.

One was the publication of three studies initiated in earlier decades. These studies and their common results may have rekindled interest in the longitudinal design. Generally speaking, the results of the McCords' study, Robins' study and Jones' study pointed to the importance of the early years of life in influencing later alcohol problems. Gomberg, comparing the McCords' and the Jones' studies (1968), stated: "What we see, then, putting these two longitudinal studies side by side, is a pre-adolescent or adolescent boy who has acquired less than adequate controls over impulsivity and aggressive impulses and who overplays the assertive, independent masculine role" (p. 18).

Robins' study, published in the early 1960s, showed that alcoholism was more prevalent among those who had been patients in a child guidance clinic than among controls and lower social class and both fathers' and subjects' serious antisocial behavior were predictive of later alcoholism. These findings set the stage for studies confined to the adolescent years, since this period in life appeared to be crucial in laying the foundation for adult problems. In other words, the existing longitudinal literature, although based on non-representative samples, showed that "the Child is father of the Man" regarding adult alcohol problems. But at least two other events in U.S. society may have contributed to the many studies initiated during this decade.

First, drugs–other than alcohol–were being used in increasingly alarming numbers by white, middle-class adolescents. This occurrence propelled studies in the 1960s (to be followed by more in the 1970s) to examine drug use among adolescents (Bachman and O'Malley, 1984; Bachman, Kahn, Mednick, Davidson and Johnston, 1967; Bachman, O'Malley and Johnston, 1978; Brunswick, 1980, 1984; Donovan et al., 1983; Garfield and Garfield, 1973; Jessor, 1983a, b; Jessor and Jessor, 1973, 1975, 1977, 1984; Johnston, 1973; Kellam, Ensminger and Simon, 1980; Kellam, Ensminger, Branch, Brown and Fleming, 1984; King, Murphy, Robins and Darvish, 1969; Nuttal and Nuttal, 1981; Robins and Wish, 1977; Robins, Murphy and Breckenridge, 1968; Temple and Fillmore, 1985a). The studies mentioned above are those which have alcohol use embedded in them; more exist which did not include alcohol variables. One study was initiated during that period which did not deal with adolescent drug use but only alcohol use (Zucker and DeFoe, 1975).

The conceptual thrust of these studies was often to examine those who became multiple users, the age and sequence of drug use onset (alcohol included) and the degree to which alcohol and drug use contributed to a constellation of other "non-conventional behaviors" (Jessor and Jessor, 1977). Because these studies were usually confined to adolescence and because the issue was more often "use" rather than "pathological use," the nature of the dependent variables in the emerging adolescent longitudinal literature turned sharply from measures of alcoholism to measures of consumption and "problem drinking." These new adolescent studies also shifted in explanatory focus from psychiatric diagnosis or psychopathology to broader social and psychological theories (e.g. the Jessors' problem proneness–which held elements of Robins' antisocial behavior diagnosis, Kandel's socialization theory and Kaplan's theory of self-devaluation). Importantly, these studies also shifted their focus away from parental psychopathology and alcoholism.

Second, in the U.S. the Civil Rights Movement of the 1950s and 60s, civil unrest in the urban ghettos, and the Poverty Program of the 1960s contributed to an interest in urban black youth, around issues of drug and alcohol abuse as well as around the issues of poverty and disadvantage. Within these contexts, four U.S. longitudinal studies of black youth were initiated (Brunswick, 1984; Kellam et al., 1980; King et al., 1969; Maddox, 1970; Robins and Ratcliff, 1978-9; Robins and Wish, 1977; Robins et al., 1968). With the exception of the Maddox study of college students, the remainder were studies of urban blacks.

Many of the adolescent studies yielded a rich description of the correlates and predictors of onset of alcohol use and heavy and/or problem use in adolescence. A number of them, due to the short period between measurement points, released some results by the late 1960s and early 1970s. In 1968, Robins et al. could report that while young black men experience antisocial disorders more than the whites studied a generation previously, the childhood factors were equally important in both groups insofar as predicting antisocial behavior, in general, and alcoholism, problem drinking and heavy drinking, in particular, in adulthood; in 1969, King et al. painted a bleak picture of those black men with adult alcohol problems "in the urban Negro ghetto cycle of broken home, delinquency, reproductive irresponsibility, and under-employment" (p. 1,690). In 1973, Johnson reported on a national sample of boys examined during and after high school (much more representative than the Robins' research) showing that higher grades in high school were associated with lower levels of alcohol use. In 1973, the Jessors forged a link between personality and problem drinking in a community sample of youth; in 1975, the Jessors demonstrated that onset of drinking in youth was one behavior in a thread of adolescent development linked to a total picture of non-conventionality; by 1977, "proneness to problem behavior" was found to be linked with alcohol problems. This was defined as "a concern with personal autonomy, a lack of interest in the goals of conventional institutions, a jaundiced view of the larger society in general, and a more accepting view of transgression–a perspective apart from that of religion" (p. 109).

All and all, these publications set the stage for new studies of youth to be initiated in the 1970s, justifying the focus on the details of adolescent development. They were probably built on the reasoning from earlier studies (clearly Robins' studies) that early non-conventional or antisocial behavior would predict later antisocial behavior (including alcohol problems or alcoholism). However, at least four factors differentiated these adolescent studies from those initiated in earlier decades.

1. Their dependent variables changed radically from diagnoses of alcoholism to "problems" associated with alcohol and to measures of consumption. This change was probably partially derived from the common sense knowledge that adolescents were unlikely to have developed symptoms which could be characterized as alcoholic.
2. Their emphasis turned from isolating predictive variables in childhood/adolescence which would "explain" adult behavior to age-limited description of the factors involved in adolescent development associated with the adoption of a number of behaviors (including alcohol use and abuse).
3. Their models embraced broader psychosocial explanations rather than confinement to pathological explanations and their emphasis was on developmental *processes.*
4. The samples studied were more often representative of school-age children and adolescents, turning away from institutional samples or samples displaying deviant behavior.

There were other influences in the 1960s which changed the nature of longitudinal research, bringing with them some of the major contemporary controversies in alcohol research. Federal funding in the U.S. for alcohol research was available in the late 1950s, stimulating research from a variety of disciplinary approaches. Probability sampling in psychological and sociological methodology had been adequately developed to yield studies which attempted to obtain representative samples. In this context, general population longitudinal studies of adults initiated by Knupfer (1963) and later carried out by Cahalan and their associates of the then Social Research Group (now the Alcohol Research Group) brought a survey research perspective to longitudinal studies which focused on specific types of drinking patterns and problems in different segments of the population (Cahalan, 1968, 1969; Cahalan and Roizen, 1974; Clark, 1976; Clark and Cahalan, 1976; Roizen, Calahan and Shanks, 1978; Room, 1972; Williams, 1967). This research with "problem drinking" dependent variables suggested that the assumptions of the disease concept of alcoholism (Jellinek, 1952) regarding chronicity and progression and "inter-relatedness" of alcohol problems were questionable. Furthermore, the surveys found a higher prevalence of alcohol-related problems among young adult men than among the middle-aged men typical of clinical populations.

These conceptual and empirical challenges of the survey research approach to alcohol problems (Cahalan, 1970) could be and were aimed at the assumptions of the abundant clinical literature in the alcohol field. For the purposes of this review, they also challenged the assumptions of many of the existing longitudinal studies, which had painstakingly diagnosed or taken from diagnostic accounts or records an entity called alcoholism. The assumption had been that once you "caught" the disease, it was most difficult to "shake" it. However, when this assumption was put to samples of the general population, it was found that, while there was some continuity of drinking problems over time, there were also substantial numbers of those with drinking problems at one point who reported none at a second measurement point. The implication for longitudinal studies with only one measure in adulthood was that the measures might not necessarily indicate chronicity–chronicity being an integral part of the disease concept of alcoholism.

The undeniable differences between the clinical and general population studies led Fillmore and Midanik (1984) to re-analyze the Alcohol Research Group's longitudinal samples. Their findings suggested that if adult male longitudinal samples were controlled by age, young men were more likely to report sporadic alcohol problems (meaning very high remission rates) while middle-aged men were more likely to report chronic alcohol problems. This analysis has been expanded to describe incidence, prevalence and chronicity/remission by age of various levels of alcohol patterns and problems in comparison to sex differences (Fillmore, 1987b) and a theory has been advanced about how sex and age, representative of social statuses, act to mediate life conditions and events thought to influence drinking styles (Fillmore, 1986)

Using similar problem drinking measures, Glynn and his colleagues reported results from another multiple birth year study of male volunteers in a Boston health project which focused on older adults. The resulting six data sets from the Cahalan/ Knupfer and Glynn projects laid the foundation for both mortality studies (Bosse, Ekerdt and Silber, 1984; Day, 1978;

Glynn, Bouchard, LoCastro and Hermos, 1984; Room and Day, 1974) and studies of the population as it ages well past the fifties (Glynn, LoCastro, Hermos and Bosse, 1983, 1984; Glynn, Bouchard and LoCastro, n.d.; Room, Temple and Stall, 1984; Stall, 1984). Most studies performed during or before the 1960s were confined to the U.S. or Northern Europe. However, one longitudinal general population adult study demonstrated the possibility that the findings regarding drinking practices and problems in these countries may be culture-bound. In this respect, it deserves detailed description in this review.

This study boldly challenges the Cahalan group's findings by suggesting that the excessive "turnover" in drinking patterns and problems found in the U.S. is not found in other cultures. Gillis and Stone (1977) studied 500 randomly selected Coloured adults from the Cape Peninsula in South Africa in 1963, following up three sub-samples six years later. The first group consisted of "addictive drinkers," defined by "loss of control of drinking, 'koppeerdop' (an early-morning drink to allay discomfort), craving, shakes, blackouts, 'lost' weekends, loss of interest in food, or trouble at home, at work, or with the law because of drinking" (p. 789) and "pre-addictive drinkers," defined as "those who undoubtedly drank to excess and also showed certain features, but not the full-blown picture, of addiction" (p. 789). Collateral interviews and evaluations performed by psychiatrists "who had extensive experience of the cultural background of the subjects" were used to arrive at these diagnoses. The control groups consisted of psychiatrically disturbed individuals and those who were not. Both groups were social drinkers or abstainers at Time 1. Of the 30 addictive or pre-addictive drinkers (2 females), 27 or 90% did not change their drinking pattern six years later. Of the control group who were psychiatrically impaired, 88% of the males and 100% of the females did not become addictive or pre-addictive drinkers. And of the non-psychiatrically disturbed group at Time 1, 92% of the males and 95% of the females did not become addictive or pre-addictive drinkers. The mean age of the addictive and pre-addictive drinkers was 36.6. The psychiatrically disturbed control group's mean age was 47.1. And the non-psychiatrically disturbed control group's mean age was 44.3. Excess mortality was found among the controls who were older. The authors describe the remarkable stability in drinking patterns as bearing out "the clinical impression that excessive drinking among Coloured men begins in early adult life, or even in adolescence" (p.790).

The important point to be made here is that while the U.S. general population adult studies did not support clinical observation, in South Africa, among one racial group, they did. These results strongly suggest that culture may be a powerful discriminator in determining age-related patterns of drinking and drinking problems. In the U.S. a high degree of remission of drinking problems among young men is found (Fillmore and Midanik, 1984), but among Coloureds in South Africa, this is not the case. The contrast of these two quite similar longitudinal studies, performed in different cultures, points to the fallacy of making generalizations regarding maturation should the research deal only with similar or the same cultures.

Other studies outside the U.S. during the 1960s echoed the same trends by studying adolescents and/or employed measurements of disaggregated alcohol problems and consumption. In Finland, both Pulkkinen (1982, 1983) and Bruun (1965) used measures of consumption in studies of the adolescent years; in Puerto Rico, Nuttal and Nuttal (1981) used a measure of consumption embedded among measurement of other drugs in a study from adolescence to young adulthood. In Finland, Ekholm (1968) carefully delineated the patterns or "rhythms" of alcohol use among a non-random sample of men, using an average of 20 data points in one year's time. The same men were followed up, 18 years later, in a mortality study (Poikolainen and Simpura, 1983) and in a study to determine the accuracy of retrospective reports (Simpura and Poikolainen, 1983). Regarding the latter study, and in the interests of methodological issues, it is important that these analysts found systematic over-estimation on both the sample and individual levels of consumption reported retrospectively — a finding quite contrary to the assumptions that heavy drinkers "hide" their drinking or that under-estimation of consumption, measured retrospectively, is to be found among the general population.

While the proportion of longitudinal studies of special populations decreased as the single birth year and multiple birth year cohort studies increased during this decade, the majority of the special population studies were concerned with incarcerated criminals. Martin, Cloninger and Guze (1984) in the U.S. and Medhus (1974) in Sweden studied female prisoners while Goodwin, Crane and Guze (1971) studied male prisoners. In two Swedish studies, Rydelius (1981a, b) studied youthful offenders picked up on drunkenness charges. Another special population study was a sample of emotionally, developmentally and physically impaired children and adults drawn from a general population study to assess life adjustment, with alcohol use included as one of many measures (Butler and Friedman, 1984).

Other studies during this period included Farrington's and West's (1981) developmental study of delinquency, which incorporated alcohol measures (these results have not been reported to our knowledge) and a series of sociological studies which tested the influences of norms and group affiliation on deviance (Alexander and Campbell, 1970; Britt and Campbell, 1977a, b). This latter group of studies reflected a pronounced interest in the 1960s in testing sociological theory in a longitudinal framework. A study of alcoholics in treatment who had been given the MMPI as college freshmen was reminiscent of earlier decades, where solely psychological variables were used for prediction (Hoffmann, Loper and Kammeier, 1974; Kammeier et al., 1973; Loper, Kammeier and Hoffman, 1973).

In Sweden, Bohman and Sigvardsson (1978, 1980; Bohman, 1971) initiated a study of 624 children born between 1956-7 of unwanted pregnancies–a study signaling a future concern with genetics. They compared children who had been adopted, returned to biological mother and placed in foster homes. These groups (and a control group) were followed up until age 22 using institutional records. Children placed in foster homes were more likely to demonstrate alcohol abuse than any of the other groups. Further, children of alcoholic biological parents were no more likely than children of non-alcoholic biological parents to demonstrate alcohol problems.

Even with the major changes in longitudinal research in the alcohol field during the 1960s, the interest in females and alcohol use and abuse still remained at a low point, such that females were included in only about half of these studies.

In summary, the decade of the 1960s was characterized by studies concentrating on adolescents (including black adolescents) which, for the most part, had short periods between measurement points and by studies of the adult population, typically also with short periods between measurement points. Consumption measures and measures of disaggregated alcohol problems in these studies all but replaced the more clinical measures of alcoholism of previous decades. Probability sampling methods were more strictly adhered to. Studies of the adult general population laid the foundation for studies of mortality and morbidity as well as for studies which are only now beginning to examine alcohol use and abuse in old age. Both adolescent studies and adult general population studies, with shorter periods between measurement points, began to pay attention to temporal order of alcohol use and abuse in small segments of time in their subjects' lives. In turn, this attention introduced new thinking about alcohol and the life span with the findings that alcohol use and abuse were neither static nor easily described entities.

THE 1970S: THE EMERGENCE OF GENETIC STUDIES–"A GROWTH INDUSTRY"–AND "NATURAL EXPERIMENT" STUDIES

Interest in the drug use, alcohol included, of adolescent and college populations continued in the 1970s (Coombs, Fawzy and Gerber, 1984; Crowley, 1983; DiTecco and Schlegel, 1982; Donovan et al., 1983; Hashway, Hesse, Nutile and Taylor, 1980; Huba and Bentler, 1984; Huba, Wingard and Bentler, 1981; Jessor, 1983a, b; Jessor and Jessor, 1984; Kandel, 1975, 1978, 1983; Kandel and Faust, 1975; Kandel and Logan, 1984; Kandel, Kessler and Marguiles, 1978; Kandel, Raveis and Kandel, 1984; Kaplan and Pokorny, 1977, 1978; Marguiles, Kessler and Kandel, 1977; Mellinger, Davidson and Manheimer, 1974; Mellinger, Somers and Manheimer, 1975; Schlegel, d'Avernas and Manske, 1985; Sieber and Angst, 1981a, b; Yamaguchi and Kandel, 1984). The majority of these studies sought to delineate socialization or social-psychological models to account for the onset of drinking and drug use and resulting problems (Kandel, 1983). Another study initiated in the 1970s (Lester et al., 1984) expanded to include biological measures on sequential age cohorts of adolescents. The longitudinal results have not yet emerged. A study reminiscent of an earlier period in the literature reports on male and female adolescent patients admitted to a psychiatric service as well as juveniles arrested for alcohol-related problems (Morrissey, n.d.; Schuckit and Chiles, 1978). A Polish sample of 12 and 13 year olds whose parents abused alcohol was followed up four years later and showed that parental alcohol abuse had a persistent negative effect on the children's social adjustment (Ostrihanska, 1982; Ostrihanska and Wojcik, 1984; Wojcik, 1984). Last, a study of the smoking and drinking habits of Hong Kong university students demonstrated that males began to drink during the college years but relatively few females did (Bard and Peacock, 1976).

In 1978, Kandel reported on the convergences of the studies on adolescents which began in the 1960s and 70s. Among her conclusions: 1. the use of legal drugs almost always precedes that of illegal drugs; 2. antecedents of hard-liquor use are minor delinquency and use of cigarettes, beer and wine; 3. anticipatory socialization precedes the initiation of both legal and illegal drugs; 4. susceptibility to peer influence and parental models, attitudes and closeness influences use.

While this convergence of findings from predominantly American youth studies yielded a rich description of the correlates and antecedents of various usage patterns, it was not until the 1980s that this particular literature could begin to assess the impact of the variables measured in adolescence on adult behaviors, including drinking practices. The findings from these studies and the potential for future analyses differ from those studies begun before the 1960s. The fact that the latter group was interested in process provided an avenue of exploration in which behaviors could be described at multiple points in time. This meant that not only was more detailed epidemiological description possible but also that interposed variables in the intervening period could be assessed regarding the events and conditions which might alter behavior.

Among the findings which are only beginning to emerge are these: First, reflective of the adult longitudinal studies of the 60s, a strong continuity in drinking patterns and problems was not found between adolescence and young adulthood (Donovan et al., 1983; Jessor, 1983a, b; Jessor and Jessor, 1984; Kandel and Logan, 1984; Kandel et al., 1984; Temple and Fillmore, 1985a). From an epidemiological point of view–taking a bird's eye view at the drinking practices in the entire life cycle–this means that in the adolescent and young adult years both a high incidence into and a high remission from alcohol problems take place (see Fillmore and Midanik, 1984, for a comparison of men in young adulthood to men in middle age, which generally replicates these findings). Second, the evidence isn't yet in on strong antecedents of later alcohol problems–a situation to be addressed in a later section of this report. This fact, in itself, raises questions regarding the earlier longitudinal work using non-representative samples which found strong and significant antecedents to adult alcohol problems.

Interest in the adult life cycle continued in the 1970s. Menagham, Pearlin, Lieberman and Mullan (1984) studied a general adult population sample in terms of life events, role conditions and adaptation. To date their alcohol-related longitudinal results have not been reported. Aneshensel and Huba (1983) studied the temporal relationship of alcohol use and depression in an adult general population sample over one year's time. They found that while alcohol use may lead to decreased levels of depression, in the long run (over the entire year) it leads to slightly heightened depression levels. The effects of depression on increased alcohol use appeared to be relatively short term. Hingson, Scotch, Barrett, Goldman and Mangione (1981) performed an adult general population study to evaluate the influence of life satisfaction on drinking behavior but the longitudinal results have not yet been reported.

A general population longitudinal study in Iceland done during the 1970s (Bergsveinsson, 1974; Helgason, 1977, 1981; Helgason and Asmundsson, 1980) suggests, like the South African study, the power of culture in affecting the epidemiological results. Unlike the great majority of findings from Western Europe and North America, women were likely to report prevalence and incidence of symptoms of alcohol abuse which slightly exceeded men's.

The women's movement may have partially influenced an upsurge in the number of studies including females initiated during this period.

While 1970s longitudinal studies continued to focus on youth and on the adult life course, two additional types of studies appeared, representing polar extremes in the alcohol literature. One type measured the influence of adults of natural or contrived environmental changes on drinking and other variables in the short term. The other type was adoptee studies which laid the groundwork for what Goodwin (1984) has called "a growth industry"–an entirely new kind of longitudinal study emerging in the 1980s–the biological marker study.

The environmental studies brought a new tradition to alcohol-related longitudinal research by broadening the considerations beyond those confined solely to developmental or maturational issues. Six studies during the 1970s focused on changing environmental influences or "natural experiments" as related to multiple dependent variables, alcohol patterns and problems among them.

A unique study was initiated on Vietnam veteran heroin users returning home to the U.S. and relevant control groups (Robins, 1973; Wish, Robins, Hesselbrock and Helzer, 1979). Alcohol problems decreased during the service period but increased among veterans upon return and then remained fairly stable; and there was no evidence of using alcohol as a substitution for heroin upon return. These authors conclude that the increase in alcohol use upon returning was influenced by availability.

A Scottish study sampled newly recruited manual workers from the brewing industry (which is known as a high-risk population for alcohol problems) and controls from non-brewing industries (Plant, 1978, 1979, 1981). Those exposed to the drink trade were consuming at higher levels, had increased alcohol problems and were drinking at work more than were the controls.

Another Scottish study (Kendell, de Roumainie and Ritson,1983) examined consumption when the price of alcohol in the interim period rose faster than both the retail price index and average disposable income. Consumption and adverse consequences of alcohol use dropped between the two measurement points; heavy drinkers and dependent drinkers were as likely to reduce their consumption as light or moderate drinkers.

A fourth study of this type involved samples from two communities in the Shetland Islands, one being changed considerably by increased availability of alcohol and rise in income due to the rapid industrialization of the oil industry (Caetano et al., 1983). Increases in mean alcohol consumption (as a result primarily of drinking frequency) were higher in the community undergoing the major change.

An Australian study (Homel, 1986) examined the effect of roadside random breath testing on perceptions of social controls and behavior, finding that the deterrence model was supported.

A last study evaluated an alcohol abuse prevention program in a college setting (Greenfield and Duncan, 1984). It was concluded that an "agglomeration process" takes place where group living arrangements predict alcohol problems which were especially high among those living in fraternity settings.

Five of these longitudinal studies converge to suggest that environmental influences can significantly change consumption patterns and behaviors associated with drinking. These longitudinal studies point to public health measures to curtail consumption and related problems. Of considerable importance, these studies deflected attention from maturational processes or antecedent variables resting solely in the *individual* and turned to larger economic and environmental factors which might alter or redirect drinking practices. Equally important, this line of research reveals one of the confounding factors in the majority of longitudinal research performed to date–namely, that historical factors have the potential of changing the face of maturational findings. And, it is worth pointing out, that an historical factor–namely the use of drugs by adolescents in the

1960s–was one, among other factors, stimulating longitudinal research among adolescents during that time.

In addition to the environmental studies, a group of adoptee studies emerged to again change the face of future longitudinal work (from Denmark: Goodwin, Schulsinger, Hermansen, Guze and Winoken, 1973; Goodwin, Schulsinger, Knop, Mednick and Guze, 1977; from Sweden: Bohman, 1978; Bohman et al., 1981; Cloninger, Bohman and Sigvardsson, 1981; from the U.S.: Cadoret and Gath, 1978; Cadoret, Cain and Grove, 1980; Cadoret, O'Gorman, Troughton and Heywood, n.d.).

The design rationale of these studies was to determine if genetic factors predispose individuals to alcohol-related problems; they compare the adopted-out offspring of those whose biological parent(s) were regarded as having some type of alcohol problem versus those whose biological parents were not. This design is an improvement over twin studies, where it may be inappropriately assumed that the environments of both fraternal and identical twins are constant (Goodwin, 1971), and clearly an improvement over family studies where nature and nurture are intertwined. While the ages at follow-up differed, all the studies showed there is a "genetic factor" operating between alcoholism in fathers in particular and their sons. These findings have paved the way for future studies planning follow-up with varying hypotheses in search of the "biological marker or markers" which will hypothetically point to this genetic factor.

The genetic evidence regarding women is less conclusive. The Danish sample found no evidence; evidence from the Swedish sample showed a relationship between alcoholism in the biological mother and daughter but not the father and daughter; evidence from the U.S. sample suggests an increase in alcohol abuse among females whose first-degree relatives experienced alcohol problems.

Two of these studies looked at environmental influences. The Cadoret studies interviewed the subjects and their adoptive parents, finding an increase in childhood antisocial behavior among those who would later become alcoholic. But the antisocial behavior was not related to the parental alcoholism. However, the attrition rate was so high in this study that the conclusions should remain exceedingly tentative. The Swedish study used adoption and other records to determine if any early characteristics might play a role in predicting alcoholism. It was found that lower occupational status of the adoptive father, an older age of placement, higher early contact with adoptive mother and, for females, living in a rural environment influenced the development of alcohol problems.

Four other studies concerned with the effects of parental alcoholism emerged during the 1970s. Crowe (1974) studied adoptees born to female offenders, interviewing the offspring at "a mean age of 26 to 27," to determine if there is a genetic link between antisocial behavior in biological parents and offspring. There were no differences between probands and controls regarding antisocial behavior in parent and alcoholism in offspring. While this was not an adoptee study, Kaij and Dock (1975) studied the grandsons of alcoholics to test a sex-linked hypothesis regarding the transmission of alcohol abuse. The findings indicated a threefold risk for the grandsons of alcoholics to be registered for alcohol abuse in Sweden at least once. Hesselbrock, Stabenau and Hesselbrock (1985) in a genetic marker study regarding minimal brain dysfunction and neuropsychological test performance have followed their "high risk group" (offspring with parental alcoholism) and a control group from a mean age of 24 to 28. While they plan to follow this group at a later time, their findings to date do not indicate a higher frequency of problem behavior in childhood among the high risk group or evidence of cognitive deficits. Schuckit, Goodwin and Winokur, (1972) studied alcoholics and non-alcoholics raised by a non-biological parent. They found that drinking problems were more prevalent among those who had a biological, rather than a surrogate parent, with drinking problems.

The importance of the genetic studies is validated by the fact that the majority of the special population studies planned for the future will explore biological marker hypotheses. This interest is the most contemporary in a line of longitudinal research which has been instrumental in changing the nature of thinking in the alcohol-research world.

Longitudinal Research in the 1980s

Several studies began in the early 1980s and have been completed. Grube and Morgan (1986) studied Irish school children's alcohol, drug and smoking use. Plant, Peck and Samuel (1985) studied children in transition from school to taking on the roles of adult life. Their three-year follow-up replicates the findings in other longitudinal research that there is a relatively weak relationship between drinking patterns at two points in time. Teichman and Rahav (1986) collected data on high school students in Israel with one year between measurement points. The findings suggest an increase in the prevalence of consumption among youth in comparison to earlier cross-sectional studies.

A multiple cohort West German and Polish study of adolescents is underway, with annual waves of follow-up since 1982 and plans for continued follow-up (Silbereisen and Noack, 1985). The conceptual orientation of this study in part focuses on the constructive function of alcohol use among adolescents as a normal part of the developmental process.

Other studies are underway, with plans for future follow-up, and several analysts who have already published longitudinal results plan to continue tracking their samples. Among the latter group are the following.

The Hesselbrock team will continue studying their high risk and low risk subjects through "age at risk." The Kandel samples and the Jessor samples will be followed at later dates–both studies should provide valuable data from adolescence to middle age. The Schuckit and Morrissey sample (1976) of deviant children is to be studied further, lending itself to cross-cohort comparisons with psychiatrically-oriented studies initiated prior to the 1950s. Ojesjo has tentative plans to follow up a few "high risk" groups in his community sample. Two San Francisco longitudinal community studies, currently being followed up by Room et al. (1984), should provide valuable data regarding alcohol use among older age groups. Casswell, Gilmore, Silva and Brasch (1983) possess data on eight- and nine-year-olds in New Zealand, recently re-interviewed up at age 13, and expect to follow up at ages 15 and 17. Communications with those possessing valuable longitudinal data who anticipate future followup indicate two major, but not uncommon, concerns–sample attrition and the ability to raise the money to perform the studies.

Those studies with one existing measurement point which anticipate follow-up include a single birth-year cohort from the U.S. of a study of adolescents' use of alcohol and drugs (Moberg, Robertson, Fischer and Downs, 1982). Four multiple birth-year cohort studies are anticipated. A general population follow-up survey from West Germany (Korczak, 1983) was in the field in 1983. The first American general population follow-up survey focusing on women was in the field in 1986 with six years between data points (Wilsnack and Wilsnack, 1984). This particular study is much needed, given the blatant under-study of women in this literature. A Canadian study is surveying two communities serving as experimental and control sites in a secondary prevention program (Giesbrecht and McKenzie, 1983; Giesbrecht, Conroy and Hobbs, 1984). Longitudinal data from five sites of the Epidemiological Catchment Area Programs in the U.S. were collected on adults in 1979-81 and three years later (Robins and Przybeck, n.d.). Alcohol-related longitudinal data are available but not yet analyzed on a large U.S. labor market survey of youth age 17-25 at Time 1 with two annual waves of follow-up (Crowley, 1983). This study is unique in its oversampling of blacks and Hispanics. A Czechoslovakian study of alcohol use among men 22-33 was started in 1983-84; anticipation of follow-up is in 1988 (Kubicka, 1985) and the same research team is planning a "sister study" of women in the future (Gebhart, 1985). It is worthy of mention as well that a prospective community study of youth is proposed in the near future in Japan (Kono, 1985).

Most of the future special population studies are biological marker studies, selecting children of alcoholics and relevant controls to assess vulnerability to alcohol problems as expressed through "markers." The major advantage of these studies is that the "illness" will be studied before its onset and contamination from medications, hospitalization and self-image regarding alcohol problems will be eliminated (Schuckit, 1984). Tarter and Ryan (1983) may be forecasting the future of this type of research with their suggestion that alcohol-related neuropsychology studies should be broadened out into longitudinal designs to more clearly outline, not just the antecedent neuropsychological characteristics, but also the processes of impairment resulting from alcohol.

A first "marker" study investigates boys between ages six and 18 of alcoholics, matched by age and education to boys of non-alcoholics, with the hypothesis that brain aberrations antedate exposure to alcohol (Begleiter, Porjesz and Bihari, 1984a; Begleiter, Porjesz, Bihari and Kissin, 1984b; Porjesz and Begleiter, 1985). This research will measure the children on a yearly basis. Comparing the electrophysiological recordings of these groups to date, the samples significantly differ in some types of wave length, with the boys of alcoholics having wave lengths similar to those found in alcoholics.

A second study examines static ataxia in a similar design (Hegedus, Tarter, Hill, Jacob and Winsten, 1984b) of boys with a mean age of 13 whose fathers were either alcoholic, depressed or normal. Sons of alcoholics have been found to be more ataxic than sons in the other two groups; these children will be followed up until the "age of high risk" (personal communication with Tarter, 1984).

A third study uses a sample of delinquent male adolescents (mean age, 16) awaiting adjudication by the juvenile court; these boys have biological fathers who are alcohol abusers or report dependence problems (Hegedus, Alterman and Tarter, 1984a; Tarter, 1981; Tarter, Hegedus, Goldstein, Shelly and Alterman, 1984). The reason for selecting this sample was to control for antisocial behavior. The cross-sectional results to date indicate no differences in hyperactivity but differences in learning achievement, perceptual-motor ability, memory and language processing. Sons of alcoholics were more neurotic but less impulsive than the control group.

A fourth study (Knop, Goodwin, Teasdale, Mikkelsen and Schulsinger, 1984; Pollock, Volarka, Mednick, Goodwin, Knop and Schulsinger, 1984) uses an adoptee birth cohort in Denmark to study potential markers among men first measured in their early 20s. Results to date indicate that high risk men perform worse on the Halstead Categorizing tests, WAIS vocabulary test and Porteus' Maze test but do not differ from controls on personality disorders or drinking behaviors, although they are more impulsive. Some electroencephographic differences are those of lateral differences based on measures of EEG delta, theta and beta distinguishing high risk subjects, with some additional differences after alcohol administration.

A fifth study (Schuckit, 1984, 1985; Schuckit and Rayses, 1979) studies blood acetadehyde in high and low risk male subjects (mean age 23) in which concentrations were significantly elevated in the high risk group. It was also reported that those at risk felt less intensive feelings of subjective intoxication after drinking.

A study initiated by Zucker and his colleagues (Noll and Zucker, 1983; Zucker, Noll, Draznin, Baxter, Weil, Theodo, Greenberg, Charlot and Reidner, 1984a; Zucker, Weil, Baxter and Knoll, 1984b; Zucker, Weil and Greenberg, 1984c) is probably a forecast for future inter-disciplinary studies where developmental hypotheses are explored within the framework of non-representative samples selected on the basis of a genetic hypothesis. This study concentrates on developmental issues in young children who have an alcoholic parent (in this case, families with "alcoholism" were chosen from a DWI population) and a control group of families. The objective of this research is to determine the contribution of genetically mediated personality, social learning, family influence and peer influence on drinking patterns and problems.

CONCLUSION

What is to be learned from this historical excursion? What are the implications regarding policy? And, does this review sharpen our scholarly instincts for future work in this area?

First, this review has suggested that longitudinal research has served as an important tool for both eliminating hypotheses and generating new ones. Some of the studies have been instrumental in changing the direction of our thinking about alcohol use and abuse in the life course. While earlier studies focused on the thesis that the child is father of the drinking man by examining the notion that psychopathology found in childhood and youth would be related to problems in adulthood, these studies brought with them the assumption that, once attained, alcohol problems were static and chronic. Later longitudinal studies pointed to the fluidity of drinking patterns and problems in adult life and described the weak relationships between adolescent characteristics (including drinking behavior) and adult drinking. Some recent longitudinal studies have sought to understand the flux in drinking patterns as a function of environmental variables. Others have suggested that conditions prior to birth itself are relevant to a static and chronic condition called alcoholism. In these respects, important findings and explanations of human behavior, but often conflicting ones, have been advanced by use of the longitudinal method.

Second, even though the great majority of longitudinal work has taken place in only a few countries and has been confined to the 20th Century, a reading of this literature makes it clear that longitudinal researchers–having in common an interest in alcohol but from different fields of study–rarely read longitudinal reports from outside their field and sometimes rarely from within their own field as well (as deduced from the bibliographies from their own texts). Of greater importance, longitudinal researchers have rarely been interested in replicating results from work in earlier historical periods, from other cultures or among other birth cohorts. (There are exceptions to this latter point–developmental psychologists studying adolescent drinking and other behaviors since the 1960s tend to replicate each other's work and those involved in the adoptee studies have been interested in replication.)

Why is this so? While it is no secret that the scientific disciplines tend to be relatively "ethnocentric" regarding the importance of their own explanatory frameworks and that "competing hypotheses" are rarely tested across disciplines, this does not explain the lack of knowledge of the breadth of longitudinal work among longitudinal researchers nor does it explain the lack of efforts to replicate. What may explain these puzzles may be derived from the very nature of the longitudinal research process itself.

Longitudinal studies, particularly traditional ones, can take a very long time to collect data and, consequently, the length of time between the inception of the work and publication is often many years. The lag in published results, we suspect, diminishes the importance of the findings because popular scientific explanation often has shifted. For instance, those studies which are seriously involved in replicating results are those which are "bunched up" in time and in discipline (e.g. the developmental psychologists and the adoptee studies). But we find no contemporary studies attempting to replicate the relationship between "difficult temperament" and adult drinking practices or "antisocial behavior" and adult drinking practices.

Third, longitudinal researchers interested in maturational hypotheses tend to ignore the possibility that their research findings may be unique to the historical periods, birth cohorts or cultures under study. There has been almost no effort in the longitudinal arena to take these confounding factors into account. This observation becomes obvious on reading these works–the underlying, often unspoken or unwritten, assumption is that if behavior is predicted across time, the findings are more valid than those of non-longitudinal studies which have compared the same behavior cross-temporally, cross-culturally or across age cohorts.

Fourth, like much research in the alcohol field, at least half of the longitudinal studies have excluded women, with the majority dealing exclusively with white males. The sex and ethnic limitations even further confound generalization regarding maturational and other hypotheses.

Fifth, longitudinal research has followed the emergence and decline of a variety of explanatory notions in science in general. The 1920s through the 1940s were caught up with Freudian explanations, the 50s and 60s with more elaborate psychosocial explanations and the 70s and the 80s with biological explanations. The shifts in popularity of scientific explanation may partially account for the dearth of attempts to test competing hypotheses from differing disciplinary frameworks.

The 1980s is dominated by two, rather than one, general explanatory modes for serious alcohol problems–uni-dimensional medical and biochemical studies versus studies which assume that social definition and reasons determine drinking behaviors. While modest attempts have been made to bridge the gap between these explanatory models, most of the research is pursued independently.

In their enthusiasm to locate uni-dimensional biological links, the disease model studies only modestly (if at all) acknowledge the developmental processes so carefully outlined in the 1960s and 1970s, particularly among youth. For the most part, they only superficially acknowledge change in drinking patterns and problems as a result of environmental forces, the possibility that "once an alcoholic, not always an alcoholic," or findings implying that social definition, rather than clinical paradigms, may account for diseases (Conrad and Schneider, 1980; Room, 1984). In fact, these studies are highly reminiscent of those initiated in the 1920s through the 1940s where a single theoretical approach was used in very small non-probability samples to explain the alcoholism condition.

On the other hand, the majority of non-biological studies of adolescents reviewed in this report, apart from some of those begun before the 1950s, neglect to take into serious account the presence or absence of parental alcohol problems or alcoholism or psychopathology as a predecessor to later alcohol problems. Furthermore, these studies, in their enthusiastic attack on the medical model have, in this author's opinion, disregarded the tragic realities of the chronic abuse of alcohol, regardless of how the society defines the abuse. Both "camps" have done little to bridge these gaps.

Edwards (1984a) has called for a truce between these two polarizations, which he sees as the continuing battle between the psycho-social disciplines "who see drinking behavior as a total continuum explicable at every stage of psycho-sociological accounts of behaviour (with disease models out-moded and perverse), as opposed to those who believe that to surrender the disease concept would be a betrayal of the most fundamental truth" (p.175). He suggests that both description and explanation of human drinking behavior require the disciplinary approaches working in tandem, with longitudinal studies designed to explore these hypotheses together. His observation is endorsed here.

With few exceptions, the longitudinal research scheduled for the 1980s does not reflect a real truce. It appears that this decade will be dominated by special population or purposeful samples, not because probability sampling has not been developed, but because the genetic research question now dominates the literature–one, it might be mentioned, that is a great deal less costly to explore and a great deal more appealing to the political interests of funding agencies and the liquor industry than questions demanding general population samples.

Sixth, the span of topics and the disciplines represented in alcohol-related longitudinal research deserve attention, not simply for their scholarly implications, but for their potential consequences with regard to prevention and intervention. Psychiatric orientations suggest early intervention for those with certain qualities or traits early in life, e.g. therapies for those exhibiting antisocial behavior. Public health or psychosocial orientations suggest preventive education or controlling the availability or cost of alcohol. Both approaches run the risk of interfering with people's civil rights (particularly coercion into intervention strategies) and make assumptions about education or therapy changing the future fabric of the life course.

On the other hand, genetic orientations may call for interventions which are quite different and reminiscent of a scientific movement dating from more than 100 years ago when, according to Edwards (1984b), the Society for the Study of Inebriety debated the hereditary basis of inebriety. The consequences of genetic results might include genetic counseling which Edwards suggests "would be a convenient message for those wanting no meddlesome tampering with the liquor supply" or they might categorically suggest, as was done by Reid in the last century (quoted by Edwards, 1984b), that alcoholics refrain from marriage. Indeed, sterilization or liquidation may be recommended as was the case in Nazi Germany (Fahrenkrug, 1987).

The longitudinal studies of the last several decades have provided justification for notions of prevention and intervention. When hypotheses are played out over time, their findings are much more compelling and more trusted than in most research designs because they more closely approximate causal order. Since the questions of science (and sometimes the answers as well) are as motivated by cultural influences as are any other of societies' institutions, the changing face of longitudinal research gives us pause. This is not to advocate ignoring one or another body of research. Rather it is to suggest that the issues studied by longitudinal and other research designs are a product of their historical period. In this respect, the emphasis on a "magic predictor" (whether it be psychological, biological or social) may be reflecting feelings of helplessness in a field which, to date, has located few answers to diminish the problems of alcohol. Furthermore, it may be denying the efforts of those in this field who have repeatedly maintained that human behavior is an intriguingly complex phenomenon, affected by the interaction of multiple influences. Longitudinal research in the past six decades has dramatically underscored the fact that drinking behavior is multi-causal. In this respect, considerable thought should be given to the potential social consequences when studies advocating single theoretical lines are interpreted.

Our conclusions from a reading of this literature may be judged as critical, if not harsh. In the following chapters of this report, we use these criticisms as stepping stones to reorient our thinking about the future use of the many fine and labor-intensive longitudinal studies produced in the last century. We outline a future research strategy which will coordinate these studies into a single analytic framework. The objectives are to encourage replication of some of the research findings and testing of competing hypotheses. The strategy is to create a means by which research findings can be challenged regarding their specific applicability to history, age cohort and culture. Such comparison will raise the analytic bets of this literature to address the degree to which findings from single longitudinal studies can be generalized.

Chapter 3.

LONGITUDINAL STUDIES AND THEIR POTENTIAL FOR EPIDEMIOLOGICAL DESCRIPTION ACROSS CULTURES, HISTORICAL PERIODS AND AGE COHORTS

Longitudinal research can provide a unique contribution to epidemiological description by charting the prevalence, incidence and chronicity of drinking patterns and problems in the population-at-large. For the most part, epidemiological description in the alcohol field has been confined to either social statistics or to general population surveys. The first tells us much about the incidence and prevalence of different alcohol-related problems from the viewpoint of society's institutions, but little about those that do not come to the attention of these institutions. The second tells us much about the prevalence of different alcohol-related problems in the general population but little about the incidence or the chronicity of them.

Single longitudinal studies are limited by a number of factors. To date, existing studies do not cover the entire life span; therefore, complete knowledge regarding the incidence or chronicity of drinking patterns and problems across the life course is lacking. Equally important, the results of single longitudinal studies are confounded by the time in history in which measurements are made and by the uniqueness of the cohorts studied, thereby making conclusions regarding maturational effects less than certain (Riley and Waring, 1978). Last, the time between measurement points differs from study to study, making comparison and generalization of incidence and chronicity findings problematic.

The purpose of this chapter is to demonstrate that if existing longitudinal studies were considered together in systematic analytic fashion, our understanding of the rise and fall of alcohol problems in the life course would substantially increase. Furthermore, if existing longitudinal research projects were "analytically pooled," we could delineate those findings attributable to maturational effects, to historical influences, to the uniqueness of individual birth cohorts as they age, and to a diversity of cultural and subcultural influences. This chapter begins such an endeavor, providing both tentative results and a rationale for re-analyzing epidemiological findings across longitudinal data sets. It is hoped that this exercise will stimulate collaborative work in the longitudinal arena, that researchers will re-analyze their data in tandem.

The specific objective here is to pool epidemiological findings from the existing longitudinal literature concerning the prevalence, incidence and chronicity or remission of what we shall call "unwanted drinking behaviors." These behaviors refer to a variety of operational definitions (including heavy drinking, problem drinking and alcoholism) which researchers have measured during at least two or more points in time. It is hypothesized that these behaviors, when considered in tandem (regardless of operational definition), will show (a) a higher rate of prevalence in youth, decreasing with age (which we would expect from knowledge derived from cross-sectional general population studies), (b) a higher rate of incidence in youth, decreasing with age and (c) a lower rate of chronicity in both youth and old age (or, conversely, a higher rate of remission during these periods). Furthermore, we hypothesize that studies with longer and shorter intervals of time between measurement points will display roughly the same shape of "maturational curves" by age. Last, while we know that women demonstrate a lower prevalence of unwanted drinking behaviors, we expect (in accord with clinical observation) that the incidence of these behaviors is later in life than for men, but we have no expectations regarding sex differences for the relative chronicity/remission of these behaviors.

Taken together, we expect to find that the incidence and chronicity of unwanted drinking behaviors (in predominantly American studies) will systematically vary by age in these longitudinal studies and that this variation will inform our findings regarding the prevalence of "unwanted drinking behaviors." Such findings would benefit alcohol-related scholarly interests by describing the use and abuse of alcohol in the maturational process and would also serve the pragmatic interests of institutions charged with the prevention and intervention of alcohol problems by charting the rise and fall of these problems in the life course.

METHODS

One would think that simple epidemiological description (i.e. "turnover tables" indicating incidence and chronicity/ remission of drinking patterns and problems) would be addressed by the majority of the published alcohol-related longitudinal studies. This is not the case. In fact, relatively few studies provide this information.

This deficit may be interpreted in two ways. First, many scholars, eager to validate their pet theories, neglect to describe how their dependent variables (in this case drinking patterns and problems) have changed over time. Second, studies initiated before the 1960s, particularly those using childhood or adolescence as a start-up point, did not gather information on drinking patterns or problems at Time 1. From those studies which do contain this information, an attempt will be made to demonstrate how they might collectively, by age of measurement, provide an understanding of the rise and fall of alcohol problems in the life span.

Prevalence, incidence and chronicity findings across studies are presented by use of tables, scattergrams and means weighted by sample size within 10-year age groups. Some assumptions are violated in the comparative analysis, including the fact that sample loss across studies varies, that sample selection and types differ and that mortality is not taken into account. But perhaps the most difficult obstacle for this report is that the operational definitions of the dependent variables are *not* identical. If studies were available with identical operational definitions, the task of meta-analysis would be simpler. To synthesize the literature at this point different operational definitions must be incorporated due to the limitations and inconsistencies of definitions in the published literature. It is hoped that later collaborative work will provide analyses where operational definitions are more similar.

However, the following can be stated. Most researchers are interested in some form of "deviance" associated with drinking–something the society considers to be undesirable. The deviance is categorized by heavy drinking, a single alcohol problem (typically alcohol use to alleviate stress or strain), a number of alcohol problems, assessment by a clinician of an "alcoholic" condition, and so on. It must be assumed that the behavior is considered by the society-at-large to be unwanted, regardless of what it is called or how it is measured. Given this assumption, we expect the given epidemiological measures to show commonalties when described by age.

An additional problem is that many of the studies included here exclude females. Although we have little data regarding women, we feel it is important to explore unwanted drinking behavior in this group.

Also, some studies do not contain complete data regarding prevalence, incidence and chronicity/remission. This means that comparisons across these three epidemiological measures may utilize different studies. Not all the studies used the same interval of time between measurement points; they range from one to 20 years. The "window" through which a given sample is viewed may distort the amount of change (incidence or chronicity) in two ways. First, as has been observed in clinical samples, rates of abstention may vary by the time frame inquired about (e.g. one month versus six months) (Armor, Polich and Stambul, 1978). Although we are not inquiring about abstinence here, it is likely that the time frame addressed by many questionnaires influences epidemiological description because so many alcohol problems are rare events. Second, it may be that the longer the time between measurement points, the higher the probability of change from one drinking status to another. In the latter respect, we control for time between measurement points (five years or less versus more than five years) to determine the degree to which interval between measurements influences percentages of incidence or chronicity of unwanted drinking behaviors. It is hoped that future collaborative efforts of this kind will control for shorter intervals than presented here, as well as to control for time frame. At this point, more refined analyses of this type cannot be performed.

Quite obviously, there are numerous problems. Again, this limited methodology is used in an exploratory fashion to demonstrate that such an exercise is possible. The "correct" methodology would be to use meta-analysis (Hedges and Olkin, 1985) whereby the confounding variables mentioned above would be entered as data (e.g. sample size, attrition) in a framework where the variables are coded in a like manner.

The studies utilized in this exercise are briefly described below.

CAHALAN (1968): Data for men and women were gathered in a sample of household residents in Hartford, Connecticut, 1964 and 1966-7 (N=325; age 21+). Interviews and questionnaires assessed escape drinking, which consisted of two or more of five escape reasons (e.g. drinking to forget worries) within the last three years.

FILLMORE (1987a,b): Two samples of the U.S. national general adult population are used. The first consists of men (N=725, age 21-59) interviewed in 1969 and 1974. The second consists of men and women interviewed in 1964-65, 1967 and 1974. In the latter case, only the 1967 and 1974 data points are used (N=840, age 26+). Overall problem drinking scores were computed with a cut point for the men in the first sample of 7+ and in the second sample of 4+ and with a cut point for the women of 2+. These included binge drinking, coping, loss of control, symptomatic behavior, belligerence, problems with spouse, friend or job, problems with legal, health and financial problems as a result of drinking.

GLYNN, BOUCHARD AND LOCASTRO (1984): Data for men only were gathered in a voluntary longitudinal study in Boston, Massachusetts. Self-administered questionnaires enabled assessment of problem drinking for 1,567 men between 1973 (age 28 and above) and 1982. "Men who reported that alcohol was currently affecting their physical health or psychological or social functioning were classified as having drinking problems" (p.2).

JESSOR, DONOVAN AND WIDMER (1980): Data for boys and girls were gathered in a national sample in the U.S. between 1974-78. The children were 7th and 8th graders at Time 1 and 11th and 12th graders at Time 2 (N=839). Self-administered questionnaires enabled assessment of problem drinking similar to that described below in Jessor and Jessor (1973).

JESSOR AND JESSOR (1973) AND DONOVAN, JESSOR AND JESSOR (1983): Two samples are reported by these authors with multiple measurement points. First, a high school sample of boys and girls in a Rocky Mountain school district was measured between 1969 and 1972 (N=432). This sample was later contacted in 1979 (N=403). Epidemiological data are, first, reported for years two and three of the study and, second, for year four (1972). Second, a college sample of boys and girls who were freshmen in the College of Arts and Sciences of a university in the same region were interviewed four times

(1970 through 1973) (N=205) and were followed up in 1979 (N=190). Epidemiological data are reported for drinking status between 1972-73 and 1979. Problem drinking for the earlier measurement points was defined as having been drunk six or more times in the past year or having experienced two or more negative consequences in three or more of six areas (trouble with teachers, difficulties with friends, trouble with parents, criticism from dates, police problems, driving under the influence of alcohol). Problem drinking for the last measurement point was defined as having been drunk six or more times in the past six months or having experienced three or more of the following consequences: interpersonal problems, job-related problems, trouble with police, financial problems, accidents, problems with spouse and driving under the influence of alcohol.

MADDOX (1970): Data for black male college freshmen in a U.S. southern state were gathered in 1963 and as seniors in 1967 (N=188; median age at Time 1, 18.7) by personal interview. Heavy drinkers were defined as those drinking more than once a week, 1.6 ounces of absolute alcohol or more per occasion.

OJESJO (1983): Data for men only from a community study in Lundby, Sweden, were gathered between 1957 and 1972 (N=952; age 25+). Psychiatric examination enabled classification of cases by definitions of alcohol dependence (DSM-III 303.0) and alcohol abuse (DSM-III 305.0). Incidence by age is reported.

STALL (1984): Data for men only were obtained in a 1983 follow-up of a male San Francisco sample originally questioned by Knupfer and Room (1964) in 1962 and 1964 (N=85). The data points of 1964 and 1984 are used here. Heavy drinkers were oversampled in 1964 and weighting was used to approximate the 1962 distribution. Alcohol problems were assessed through personal interview. In this analysis, one or more of the following problems in the last year defined a problem drinker: trouble with the law, problems with spouse, job, health, and friends.

TEMPLE AND FILLMORE (1985a): Data for boys only were collected from a cohort of Marion County, Oregon, high school seniors in 1967. Ten additional measurements were taken at roughly yearly intervals, ending when the subjects were 31 (N=240). Only the measurement points of age 18 and 31 are assessed here. Drinking problems were assessed by one item in a mailed self-administered question: frequency of drinking to the point of feeling high.

WISH, ROBINS, HESSELBROCK AND HELZER (1979): Data for 451 American army enlisted men who had recently served in Vietnam were gathered in 1972 and 1974 (N=571; mean age 20). Two of seven problems in a self-administered questionnaire defined problem drinking: morning drinking, binges or benders, worry about drinking, treatment for drinking, blackouts, accidents, school-job problems and arrest (when out of the service) or disciplinary problems (when in the service).

These studies represent diverse segments of the American population. Only one study is included from another country. It is important to point out that other studies, particularly from Northern Europe and to a lesser degree from other parts of the world, contain information which would be suitable for comparative analyses but these data have not been published. The *possibilities* of a cross-study method are emphasized in this paper by using the most elementary approach to demonstrate analyses which have the potential to disentangle maturational, cohort, historical and cultural effects in the description of drinking and drinking problems in the life course. The reader is asked to be generous in acknowledging the violation of assumptions made at this point in time.

RESULTS

Figures 2 and 3 display scattergrams and weighted means for the prevalence of unwanted drinking behaviors at Time 1, utilizing 11 studies for men and five studies for women. Since several studies were follow-ups of the general population (controlled here for age), the resulting number of measurement points is 25 for men and 11 for women. These figures are in general agreement with our knowledge regarding the prevalence of "alcohol problems" in the general population for men and women in North America where prevalence tends to be highest in the 20s and early 30s for women (see Wilsnack, Wilsnack and Klassen, 1986) and for men before the age of 30 (see Clark and Midanik, 1982). The findings also inspire more confidence in utilizing weighted means of a variety of unwanted drinking

FIGURE 2

PREVALENCE OF "UNWANTED DRINKING BEHAVIORS" AT TIME 1 FOR MEN. SCATTERGRAM AND WEIGHTED MEANS FROM AVAILABLE LONGITUDINAL STUDIES COLLAPSED IN 10-YEAR GROUPS

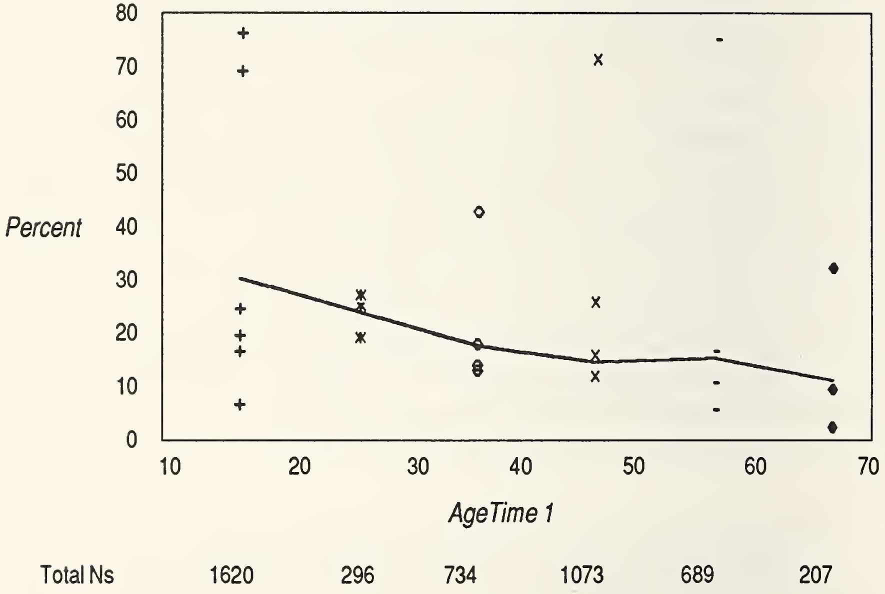
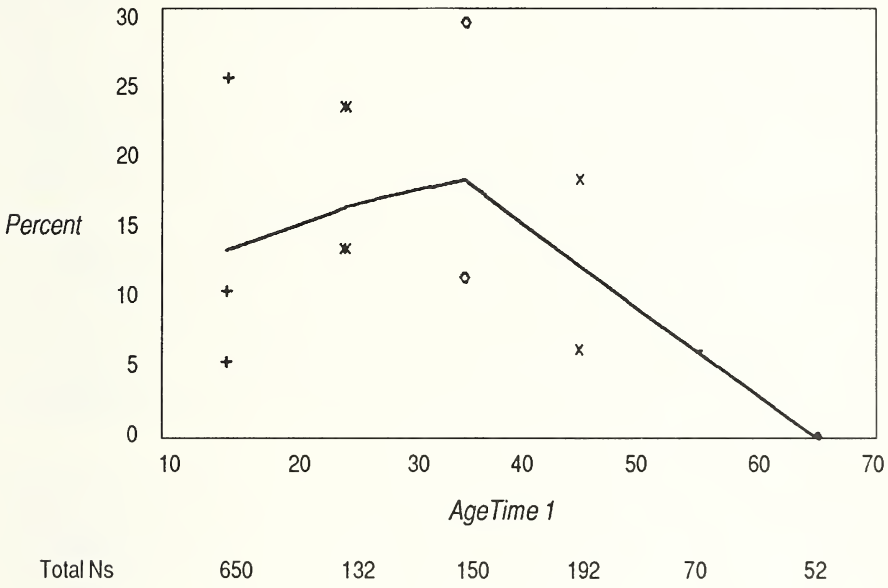


FIGURE 3

PREVALENCE OF "UNWANTED DRINKING BEHAVIORS" AT TIME 1 FOR WOMEN. SCATTERGRAM AND WEIGHTED MEANS FROM AVAILABLE LONGITUDINAL STUDIES COLLAPSED IN 10-YEAR GROUPS



behaviors because they converge with the existing prevalence literature.

In Table 1 we examine the incidence of unwanted drinking behaviors, controlling for time between measurement points for men only (too few studies are available to make this assessment for women). This analysis tests the relative effects of intervals of time between measurement points in terms of influencing the percentages of those who acquire alcohol problems within 10-year age groups identified by age at Time 1 measurement. This table can be read on several levels. First, the studies enclosed by dotted lines (studies G, H, I, J, K and M) are studies of general population or community samples. Reading down each of the studies, it can be seen that in five out of six, as age of measurement increases, the proportion of those acquiring unwanted drinking behaviors decreases, *regardless* of interval between measurement points. This is true as well for the weighted and unweighted means calculated for each age and interval group. However, reading across the studies, the longer the period between measurement points, generally the lower the incidence after age 21. These findings would suggest that incidence of unwanted drinking behaviors is a function of age among men.

Figure 4 makes this tentative conclusion clearer by use of a scattergram and weighted means at age of *Time 2* measurement for groups of studies with intervals of five years or less and more than five years. This differs from Table 1 where age at *Time 1* was recorded. The "maturational curves" for studies of longer versus shorter intervals follow roughly the same course, with incidence of unwanted drinking behaviors decreasing substantially with age for men.

Figure 5 displays the incidence data for women. While comparisons cannot be made for intervals between measurement points and while there are very few studies of women, it can tentatively be concluded that the acquisition of unwanted drinking behaviors for women, as compared to men, follows a slightly different course. Men show a steady decline with age while women peak during their 40s and then drop considerably after their 50s. This may reflect the observation from the clinical literature that women acquire alcohol problems at a later age than do men.

We have tentatively concluded that the incidence of unwanted drinking behaviors is highest in the younger age groups. If we had only the incidence findings at our disposal *and* if we assumed that once alcohol problems were acquired, they were here to stay, then we would conclude that a rather large proportion of the young (predominantly male) population

TABLE 1

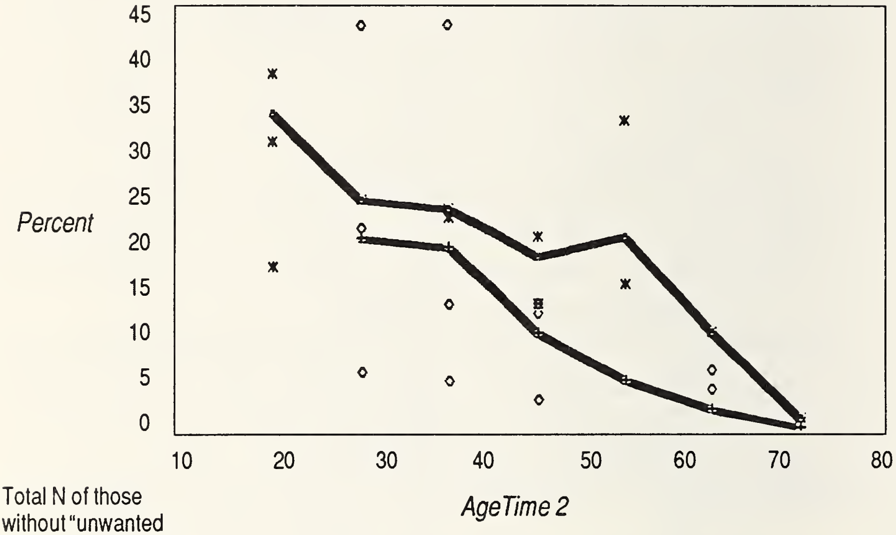
Incidence of "unwanted drinking behavior" by intervals between measurement at points of 5 years or less and more than 5 years and by age of measurement at Time 1. Men only. (W mean = mean for each age and group weighted by sample size; UnW mean = not weighted for sample size)

Age at Time 1	Interval=5years or less		Interval=more than 5 years		
Less than 20	A 30% (114) B 37% (269) C 24% (97) D 17% (457)	Wmean=25% UnWmean=27%	C 21% (79) E 21% (58) F 42% (178)	Wmean=28% UnWmean=27%	M-1 6% (116)
21-30	G-1 23% (68) H-1 22% (31)	Wmean=23% UnWmean=23%	I-1 13% (126)	W mean=7% UnW mean=9%	M-2 5% (269)
31-40	G-2 13% (105) H-2 20% (25)	Wmean=15% UnWmean=16%	I-2 11% (164) J-1 13% (313)	Wmean=9% UnWmean=9%	M-3 3% (286)
41-50	G-3 15% (105) H-3 32% (40)	Wmean=15% UnWmean=16%	I-3 4% (163) J-2 6% (611) K-1 25% (8)	Wmean=15% UnWmean=16%	M-4 2% (253)
51-60	G-4 10% (75)	Wmean=10% UnWmean=10%	I-4 4% (144) J-3 6% (372) K-2 11% (9)	W mean=4% UnWmean=5%	M-5 1% (256)
61-70	G-5 1% (71)	Wmean=1% UnWmean=1%	J-4 1% (372) K-3 0% (9)	Wmean=1% UnWmean=1%	M-6 1% (174)
Total Means by Interval		Wmean=22% UnWmean=20%		Wmean=8% UnWmean=10%	

A: Maddox (1970) - heavy drinking; B: Jessor, Donovan and Widmer (1980) - multiple problem drinking index; C: Jessor and Jessor (1983) - high school sample - multiple problem drinking index at an interval of 5 years or less and Donovan, Jessor and Jessor (1983) at an interval of more than 5 years; D: Wish, Robins, Hesselbrock and Helzer (1979) - 2 or more alcohol problems; E: Donovan, Jessor and Jessor (1983) - college sample - multiple problem drinking index; F: Temple and Fillmore (1985) - frequency of drinking to get high; G: Fillmore (1987a) - general population study controlled by 10-year age groups - 4+ alcohol problems; H: Cahalan (1968) - general population community study controlled by 10-year age groups - escape drinking; I: Fillmore (1987a) - general population study controlled by 10-year age groups - 7+ alcohol problems; J: Glynn, Bouchard and LoCastro (1984) - volunteer sample controlled by 10-year age groups - 1+ problem; K: Stall (1984) general population study controlled by 10-year age groups - 1+ problem; M: Ojesjo (1983) - total community controlled by 10-year age groups - alcohol dependence and alcohol abuse.

FIGURE 4

INCIDENCE OF "UNWANTED DRINKING BEHAVIORS" FOR MEN BY AGE AT TIME 2 (10-YEAR GROUPS). SCATTERGRAM AND WEIGHTED MEANS.



Total N of those without "unwanted drinking behavior" at Time 1							
Interval=5 yrs or less	480	457	99	130	145	75	71
Interval=5 yrs +	0	253	573	763	1035	801	324

✳ Interval=5yrs or less
✧ Interval=more than 5 yrs
━━■━━ Mean for interval=5 yrs or less
━━+━━ Mean for interval=more than 5 yrs

FIGURE 5

INCIDENCE OF "UNWANTED DRINKING BEHAVIORS" FOR WOMEN BY AGE AT TIME 2 (10-YEAR GROUPS).
SCATTERGRAM AND WEIGHTED MEANS.

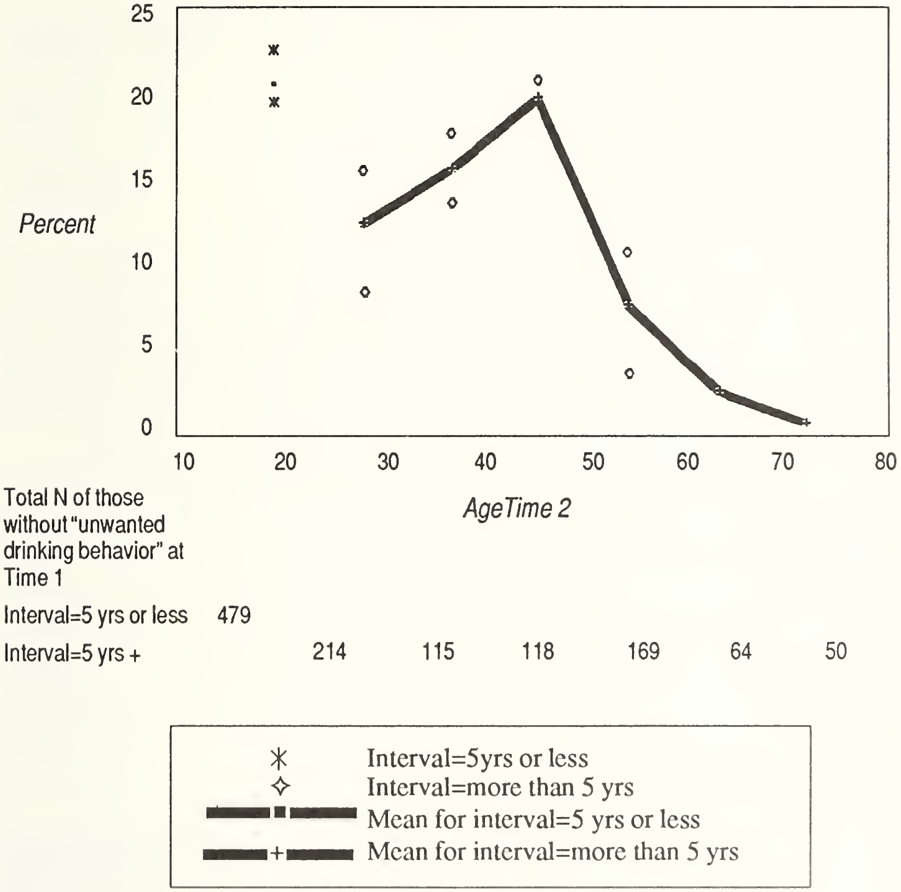


TABLE 2

Chronicity of "unwanted drinking behavior" by intervals between measurement at points of 5 years or less and more than 5 years and by age of measurement at Time 1. Men only. (W mean = mean for each age and group weighted by sample size; UnW mean = not weighted for sample size)

Age at Time 1	Interval=5 years or less	Interval=more than 5 years
Less than 20	A 42% (74) B 69% (26) C 72% (47) D 54% (94) Wmean=56% UnWmean=59%	C 43% (47) E 50% (26) F 50% (54) Wmean=28% UnWmean=27%
21-30	G-1 55% (15) H-1 45% (11) Wmean=50% UnWmean=50%	I-1 44% (45) Wmean=44% UnWmean=44%
31-40	G-2 69% (17) H-2 72% (18) Wmean=71% UnWmean=71%	I-2 72% (29) J-1 47% (72) Wmean=55% UnWmean=59%
41-50	G-3 62% (11) H-3 75% (12) Wmean=69% UnWmean=69%	I-3 74% (34) J-2 47% (72) K-1 60% (20) Wmean=56% UnWmean=60%
51-60	G-4 90% (10) Wmean=90% UnWmean=90%	I-4 56% (23) J-3 39% (31) K-2 60% (25) Wmean=51% UnWmean=52%
61-70	G-5 (1) (5) Wmean=20% UnWmean=20%	J-4 (2) (4) K-3 29% (14) Wmean=51% UnWmean=39%
Total Means by Interval	Wmean=58% UnWmean=61%	Wmean=51% Wmean=51%

A: Maddox (1970) - heavy drinking; B: Jessor, Donovan and Widmer (1980) - multiple problem drinking index; C: Jessor and Jessor (1983) - high school sample - multiple problem drinking index at an interval of 5 years or less and Donovan, Jessor and Jessor (1983) at an interval of more than 5 years; D: Wish, Robins, Hesselbrock and Helzer (1979) - 2 or more alcohol problems; E: Donovan, Jessor and Jessor (1983) - college sample - multiple problem drinking index; F: Temple and Fillmore (1985) - frequency of drinking to get high; G: Fillmore (1987a) - general population study controlled by 10-year age groups - 4+ alcohol problems; H: Cahalan (1968) - general population community study controlled by 10-year age groups - escape drinking; I: Fillmore (1987a) - general population study controlled by 10-year age groups - 7+ alcohol problems; J: Glynn, Bouchard and LoCastro (1984) - volunteer sample controlled by 10-year age groups - 1+ problem; K: Stall (1984) general population study controlled by 10-year age groups - 1+ problem; M: Ojesjo (1983) - total community controlled by 10-year age groups - alcohol dependence and alcohol abuse.

were at continued risk for alcohol problems. However, we know from studies of prevalence in the general population that alcohol problems are highest in the younger age groups, especially among men. Therefore, we would expect that not only would there be considerable incidence, but there would also be considerable remission among the young (Fillmore and Midanik, 1984). If not, substantial proportions of the population would be alcoholics or problem drinkers as they age which we know not to be the case from prevalence findings.

Table 2 examines the notion of chronicity (i.e. the percent of men reporting unwanted drinking behaviors at Time 2 of those reporting unwanted drinking behaviors at Time 1). It will be remembered that the remission is the converse of chronicity (i.e. the lower the chronicity, the higher the remission). This table can be read like Table 1 where intervals between measurement of five years or less versus more than five years are controlled.

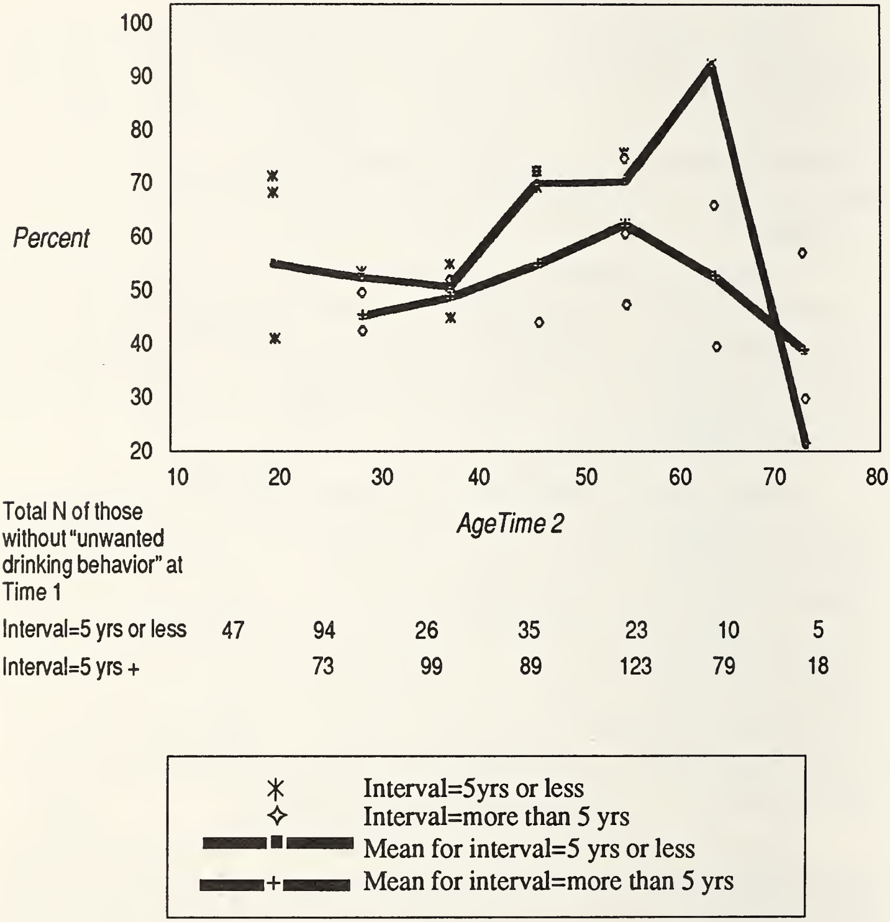
Generally speaking, the chronicity of unwanted drinking behaviors is lower with longer periods between measurement points. However, the "maturational curves" suggest that chronicity is highest in the middle years and lowest in youth and old age. Stated conversely, remission from unwanted drinking behaviors is highest in youth and old age and lowest in the middle years among men.

Figure 6 for men and Figure 7 for women display these findings for age of measurement at Time 2. Some of these findings are extremely tentative, because of excessively small samples. In particular, the only sample with an interval of five years or less for men who were in their 60s at Time 1 is 10 and for those in their 70s is five. For women, the respective Ns are 6 and 2. Nonetheless, we may tentatively conclude that chronicity is highest in the 40s for women and the 40s and 50s for men. While the rate of remission among men declines slowly by age, it drops abruptly among women. Furthermore, while the chronicity increases slowly by age for men until middle age, it rises dramatically among women.

It has been repeatedly observed in cross-sectional research that the prevalence of alcohol problems is rare among both men and women over 60. The findings here amplify this observation by tentatively demonstrating that it is highly unlikely that unwanted drinking behaviors will be newly acquired during these years and, if evident in earlier years, have a high probability of remitting among survivors. It has also been repeatedly observed in cross-sectional research that the prevalence of alcohol prob-

FIGURE 6

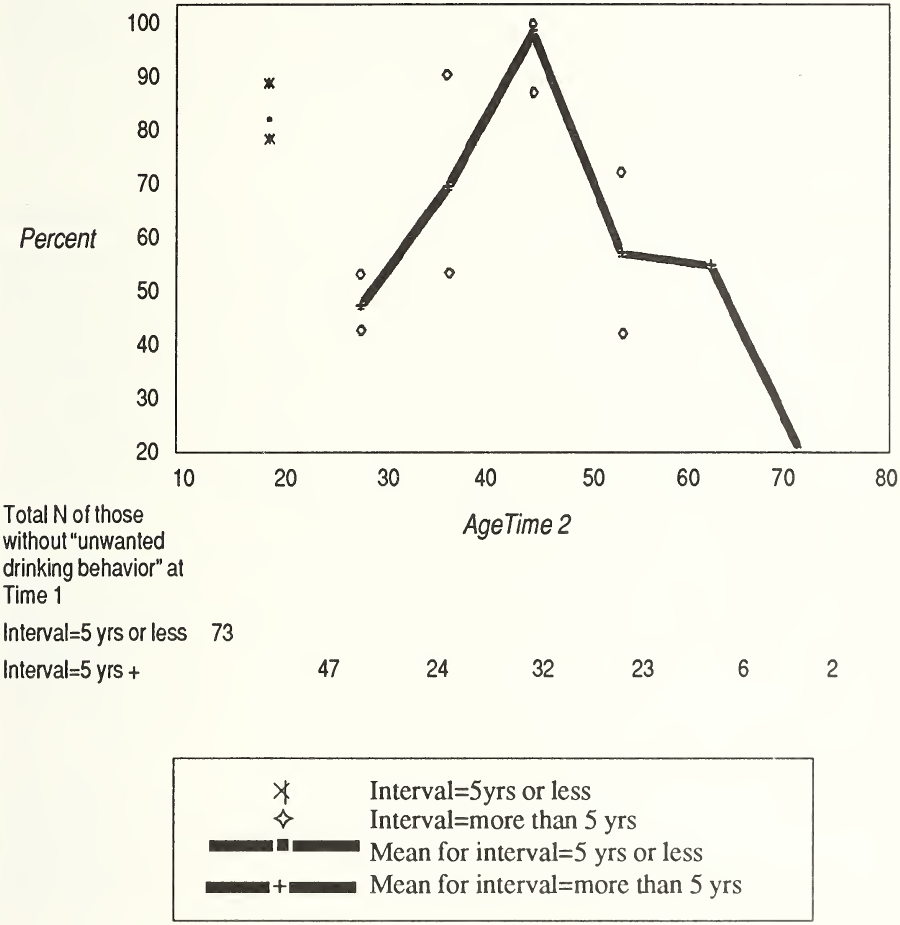
INCIDENCE OF "UNWANTED DRINKING BEHAVIORS" FOR MEN
BY AGE AT TIME 2 (10-YEAR GROUPS).
SCATTERGRAM AND WEIGHTED MEANS.



Total N of those without "unwanted drinking behavior" at Time 1							
Interval=5 yrs or less	47	94	26	35	23	10	5
Interval=5 yrs +		73	99	89	123	79	18

FIGURE 7

INCIDENCE OF "UNWANTED DRINKING BEHAVIORS" FOR WOMEN
BY AGE AT TIME 2 (10-YEAR GROUPS).
SCATTERGRAM AND WEIGHTED MEANS.



lems is highest in youth. The findings here amplify this observation by tentatively demonstrating that while the incidence of unwanted drinking behaviors is high, so is the remission. Last, it has been repeatedly observed among clients in alcoholism treatment that these persons tend to be in the middle years, but among persons in the general population the prevalence for alcohol problems is lower in this age group, compared to the young. The findings here amplify these observations by suggesting that although unwanted drinking behaviors are rare in general population samples among the middle aged, these are the years in which they are most likely to be chronic. In this sense, a bridge between what were heretofore considered discrepant clinical and general populations findings can be built.

Discussion

If the maturational findings presented in this paper are valid ones, then they have implications for much alcohol research. Studies measuring alcohol problems at only one point in time may be highly misleading should they assume that these problems represent a chronic condition. In this respect, it is important that, at the least, studies carefully establish, not only the seriousness of these problems or behaviors, but also the temporal order of them in retrospective accounts and, at the least, measure the subjects at two or more points in time. In addition, such considerations are important for eliminating "false positives" from diagnostic criteria.

The elementary analyses performed here suggest a research strategy which may disentangle to a greater extent than heretofore the degree to which maturation, birth cohort, culture and subculture contribute to the epidemiological findings (here described as the incidence and chronicity) of drinking patterns and problems by age and sex. The strategy requires a number of researchers with existing data sets to work in tandem toward this common goal.

The analysis performed in this exercise was essentially a test of an "aging" or "maturational" hypothesis derived primarily from U.S. data. A meta analysis with greater numbers of data sets, representing differing points in history, culture and age-cohorts, could be used to examine the degree to which an "age" explanation, as opposed to "cohort," "historical" or "cultural" explanations, best describe the incidence or chronicity of various drinking patterns and problems. Such questions would examine the degree of replication between samples measuring roughly the same age groups with roughly the same intervals between measurement points of incidence and chronicity and the conditions under which samples do and do not replicate each other (e.g. crosscultural or cross-ethnic differences).

We suspect that there are considerable historical effects (see Levine, 1978, for historical evidence from the time of European settlement of the U.S. to the last century) and cultural effects (contrast the South African findings of Gillis and Stone, 1977 to U.S. findings). Some attention has been given to birth cohort effects in a limited historical period in only one country (Fillmore, 1986, 1987a, b) with the result that generations born before and after Prohibition were relatively consistent in the percentage of heavy drinkers and problem drinkers as they aged from their 20s to their early 50s, with similar drops occurring after age 50. However, those tentative analyses do not exhaust the potential cohort effects, and future comparative longitudinal and cohort analyses should take these possibilities into account.

A major task of such a research strategy would also be to integrate a wide variety of potentially confounding variables into a test of "aging" and alcohol. It would be important to examine mortality. In other words, it is important to ask to what extent can death, especially alcohol-related death, explain age-related differences? We discuss this issue below.

There exists a body of longitudinal literature which has explored the relationships between alcohol use and abuse and mortality. The findings generally converge to suggest that those under age 60 who are heavy and frequent drinkers are at higher mortality risk and that those who are abstainers over age 60 are also at higher risk (Blackwelder, Yano, Rhoads, Kogan, Gordon and Palesch, 1980; Day, 1978; Dyer, Stamler, Paul, Hepper, Skekelle, McKean and Garside, 1980; Glynn et al., 1983; Klatsky, Friedman and Siegelaub, 1981; Poikolainen, 1980 for drinkers only; Room and Day, 1974; Schurleff, 1970). Particular attention has been paid to coronary heart risk. According to Marmot (1984), six of seven longitudinal studies, including ones from Hawaii, the U.S., Puerto Rico, Yugoslavia, England and Australia, find heavy intake associated with increased risk for mortality; all find increased coronary heart risk among non-drinkers. Poikolainen (1983) describes these findings as follows:

> A U-shaped relationship has been observed between alcohol consumption and mortality in many studies (Room and Day, 1974; Pearl, 1926; Dyer et al., 1980; Marmot, Role, Shipley and Thomas, 1981). This relationship seems to be mainly due to coronary heart disease, since the U-shape

> emerges more clearly when mortality from coronary heart disease or cardiovascular diseases is studied. A U-shaped or negative linear relationship is seen in populations consisting largely of abstainers and moderate drinkers (Österberg, 1979; Hennekens, Rosner and Cole, 1978; Blackwelder, Yano, Rhoads, Kagan, Gordon, and Palesch, 1980). When heavy drinkers are also included, a J-shaped pattern appears; mortality from coronary heart disease is higher among abstainers than among moderate drinkers but highest among heavy drinkers (Dyer et al., 1980).

It would appear, however, that age-related mortality risk cannot totally explain either the remission of alcohol problems among older people, the chronicity among the middle aged nor the higher incidence and remission among the young.

Drew's (1968) analysis of treatment statistics in Australia classically demonstrated the spontaneous decrease with age of those categorized as alcoholic, which could not be accounted for by increased mortality. By looking at incidence and prevalence of treated alcoholics within age groups, Drew found that "there was a decrease in the number of alcoholics in treatment after the age of 40 years compared with that which would have been predicted on the assumption that it was an irreversible condition with a mortality equal to that of the general population." Drew suggested that while mortality and chronic morbidity probably account for some of the reduction and that successful treatment accounts for a much smaller proportion, spontaneous recovery accounts for the bulk of the decline in alcohol-related problem rates with increasing age. To the extent possible, he demonstrated these propositions cross-culturally. Because there may be differential mortality cross-culturally and cross-historically, a meta-analysis would more systematically address these issues.

The analyses presented in this review bring up the questions of why there is such pronounced remission of unwanted drinking behaviors later in life, why there is such high incidence *and* remission in the younger years and why the middle years are so prone to chronicity in the U.S. These three questions have not been adequately addressed in the alcohol literature although there is some ongoing effort to explore them.

The higher incidence and remission in youth is being explored in follow-ups of youthful samples into adulthood performed by the Jessors (1984), the Kandel study (Kandel and Logan, 1984) and the Brunswick study (1984). To date, the Jessors and Kandel studies and a study performed by Temple and Fillmore (1985a) have demonstrated that during the last decade the chronicity of alcohol problems from the teenage years to the late 20s and early 30s is relatively low in the U.S. However, adequate explanation has not been provided which differentiates those who exhibit continuity or chronicity of alcohol problems across time compared to those who do not.

The higher chronicity but lower prevalence in middle age and the high remission of alcohol problems in old age are currently being explored by Fillmore in a re-analysis of the Cahalan and Knupfer adult general population samples in an effort to locate the situational variables by age which promote or diminish chronicity. The high remission in old age is also being explored intensively by Glynn and his colleagues using the Normative Aging Study in Boston (Glynn et al., 1983, 1984, n.d.) and by Room et al., (1984) in a followup of two San Francisco studies. To date, adequate explanations differentiating those exhibiting chronicity versus remission have not been generated.

These isolated longitudinal efforts to *explain* epidemiological differences (as a function of age and sex) in light of the relative power of age and sex as strong descriptive variables in drinking patterns and problems suggest a further research strategy. Such a strategy would engage meta-analysis as a research tool in multiple longitudinal studies so that prediction of incidence and chronicity could be examined within particular age strata across studies as a function of changes in selected sociological, psychological and biological variables. For example, there is considerable evidence that there is a substantial decline in consumption and alcohol problems in the older years of life, a finding first pointed out by Drew (1968). Replications across studies examining such variables as changes in body weight, health changes, socializing changes and life events would contribute to an understanding of why the differences in age are so strong.

To date we have only the most elementary knowledge of cross-cultural and cross-temporal epidemiological description by age and sex. Even less is known regarding explanation of these differences. It is important that future studies assess these questions in tandem.

Chapter 4.

CLOSER SCRUTINY OF THREE SETS OF FINDINGS EMERGING FROM THE ALCOHOL-RELATED LONGITUDINAL LITERATURE AND STRATEGIES FOR FUTURE ANALYSES

Three themes–psychological, biological and environmental–are selected from existing research for closer scrutiny. While these themes by no means exhaust the variety coming from alcohol-related longitudinal research, they do present distinctly different departure points in the longitudinal explanation of alcohol problems and they have contemporary significance in the treatment and prevention of such problems.

It is beyond the scope of this report to contrast the degree to which each and every issue raised by alcohol-related longitudinal research is replicated or compromised. In this section, we attend to questions of replication and to questions of methodology which might have confounded the results of a limited number of findings. For each, we recommend a strategy which might more effectively put the specific relevant hypotheses to the test.

THE CASE FOR ANTISOCIAL BEHAVIOR IN ADOLESCENCE PREDICTING ADULT ALCOHOL PROBLEMS

Some studies of the 1950s sought to locate behaviors in childhood and youth which would ultimately predict alcohol-related adult behaviors. Although not all of them focused on "deviant" youth, many did. For instance, Robins utilized a longitudinal design of white, child-guidance-clinic patients (Robins, 1966), the McCords used delinquency-prone boys (McCord and McCord, 1960), Vaillant chose a sample of Harvard students and also a sample of inner-city boys (Vaillant, 1983) and Monnelly and his colleagues used a sample of boys in residential treatment for behavioral problems (Monnelly et al., 1983). On the other hand, Jones' sample (1968; 1971) was white and middle class, while Amundsen's sample consisted of all 19-year-old males screened for the Norwegian military (Amundsen, 1982).

The ages of measurement for these studies differed as well: Robins measured males between ages 13 and 46; the McCords measured boys at a mean age of eight until they reached their 30s; Vaillant's college students were measured at ages 18 and 59 and his inner city boys at 16 and 47; Monnelly et al.'s boys were under age 16 at Time 1 and over 60 at Time 2; Jones' sample was 10 at first measurement and 43 at last measurement; Amundsen's military recruits were first measured at age 19 and last measured at age 50.

Taken together, these studies suggest that boys exhibiting antisocial behavior at first measurement tend to become alcoholic more often than boys who do not. Further, they tend to experience other problems in adulthood (see Robins, 1984 for a review of these findings). Antisocial behavior, roughly speaking, is defined as a collectivity of behaviors:

> These predictive behaviors for early childhood were not limited to illegal acts, but involved a set of signs of resistance toward authority, hostility to peers and adults, impulsiveness, and precocious assumption of behaviors reserved for adults: drinking, sexual relations, running away from the parental home, and leaving home (Robins, 1984, p. 1).

Robins (1984) suggests that this is a sex linked finding. Since it seems only to hold up for males, we exclude findings on females from this discussion. The evidence as it stands is summarized below.

The McCords found that more aggressive or more sadistic boys were likely to become alcoholic. Amundsen found truancy predicted those men who were later hospitalized for alcoholism (through examination of records). Robins found antisocial behavior and lower social status, among other variables, signaled adult alcohol problems. Monnelly and his colleagues, while not defining alcoholism, found body build, namely gynemorphy, to be a strong predictor, and found assertive masculine behavior to predict alcoholism as well. Jones found assertive, independent, less considerate and rebellious boys more likely to become alcoholics. Zucker and Gomberg (1984), recasting Vaillant's inner-city boys' data, found that boys who were later alcohol-dependent to have more school behavioral problems, truancy and dropout.

At first glance these findings seem persuasive; however, they may be problematic. The majority of the studies used non-representative samples, concentrating on children or adolescents in the most disadvantaged segments of society, where the combination of disadvantage and early problems might exacerbate later maladjustment among adults (at least from the white middle class point of view).

Unlike most of the studies from that era the Amundsen study was not a sample but an actual universe of 19-year-old boys in Norway. While analysis of this study is still in its initial phases, it is instructive to note those demographic variables at or before age 19 which were associated with alcoholism (measured by institutional records) before age 50. Living in an urban environment and marital change of parents during primary school were the best predictors after a multiple discriminant analysis had been performed; the second group of predictors indicate low intelligence, low education and low social status to be related to later alcoholism. In the group of neurotic inventory items, truancy and sometimes drinking to get away from trouble/worries are the better predictors. This study indicates that lower socio-economic status and maladjustment in primary school are interacting to predict later alcoholism. This would suggest (in concert with Robins' work) that the antisocial personality findings may be class-based insofar as alcohol problems are concerned.

Robins (1984) reports that longitudinal studies of representative general population samples find that conduct disorder in childhood is predictive of adult antisocial behavior (alcohol problems included in these definitions) but that cross-sectional studies find higher rates of conduct disorder in lower class urban areas. In these respects, we may tentatively conclude that alcohol problems among lower class men may be linked to the continuation of "bad boy" lifestyles. If adult alcohol problems are, in effect, class-linked then it may be suggested by extrapolation that the etiologies of alcohol problems are multi-causal and are contingent on group membership.

Four recent studies (i.e. the 1960s and 1970s) spanning the adolescent to adult years contain samples including the middle class which should provide some clarification of whether the antisocial behavior phenomenon can be generalized to other social groups. Furthermore, these studies began later, bringing with them differing assumptions regarding the dependent variable–e.g. the concept that disaggregated alcohol problems rested on a continuum rather than use of a single concept, alcoholism, which implies a distinct entity and a shift to measures of consumption–and different sampling techniques–e.g. age specific, general population samples as opposed to samples almost solely confined to "deviant youth."

In line with the earlier studies which used alcoholism as a dependent variable, Loper et al., (1973) and Hoffmann et al., (1974) studied the MMPIs of students attending a midwestern university, comparing those who would later become institutionalized for alcoholism with those who would not. They found no evidence of gross maladjustment among the students who became alcoholic:

> As a group, the pre-alcoholics appeared more gregarious, impulsive and less conforming than their peers. The lack of differences on most of the MMPI empirical scales combined with the low scores on the maladjustment scale suggest that few signs of gross maladjustment appear at this age (Loper et al., 1973).

Using a dependent variable of alcoholism (derived from existing records), this study clearly suggests that among a middle class sample, early antisocial behavior does not predict adult alcoholism.

The Jessor's and colleagues' studies (Jessor, 1983; Donovan et al., 1983) measured respondents from their adolescent/college years to young adulthood, using probability sampling in schools and a problem drinking dependent variable. They found considerable discontinuity between problem drinking over this period, confirming other longitudinal epidemiological research (Fillmore, 1985, 1987a, b) that this time in the life course is characterized by *both* high rates of high incidence *and* remission. However, their measures of "psychosocial proneness to problem behaviors" in adolescent/college years significantly discriminated between those who would exhibit continuity of problems over time from those who would not and, to a lesser degree, discriminated between non-problem drinkers in youth who would and would not report alcohol problems in young adulthood. Those adolescents who had "greater involvement in 'other' problem behavior, such as general deviant behavior and involvement with marijuana, and less involvement with the conventional situations of the church and school" would more likely be problem drinkers in young adulthood (Donovan et al., 1983).

On the surface, the Jessors' work appears to support the antisocial behavior theory. However, Zucker (1979) points out that "it is difficult to fully evaluate whether it is the engagement in transgressive or antisocial behavior that is critical, or whether it is the *involvement in behaviors that are productive of independence from family and established institutions*." Since the Jessors find that the non-conventional behaviors adopted during the adolescent years change toward conventionality with age, it is suspected that the antisocial behavior studied by the earlier researchers is different from the type studied here. Rather, the trends found are more "normal" than "abnormal." Furthermore, the Jessors and colleagues fail to control for social class. Nonetheless, in this predominantly middle-class sample some sort of personality variables measured in adolescence may lead to later alcohol problems. Whether these can be classified as "conduct disorder" is questionable.

A 12-wave study of a sample of boys in the general population, between ages 18 and 31, (50% middle class; 74% living in small cities or towns) by Temple and Fillmore (1985a) used a similar framework to the Jessors'. Like them, they found "problem drinking" (in this case, the frequency of drinking to the point of "feeling high") discontinued over time. Measures of family social class, family support, school success, positive self-concept and negative peer networks were good cross-sectional predictors of "problem drinking" at age 18. However, the predictive value of these variables measured at age 18 dropped by at least half a year later and by the mid-20s vanished altogether. But, as in the Jessors' research, measures of antisocial behavior were not directly assessed.

More currently, Temple and Fillmore (1985b) found that a measure of delinquency is strongly related to the frequency of getting high when both are measured at age 18. However, by age 31, even controlling for the drinking measure at age 18, the relationship between youthful delinquency and drinking to get high did not hold in the sample as a whole. Remarkably, delinquency in youth did *not* predict the drinking measure among the lower class. However, among the middle and upper classes, almost twice as many who were delinquent in youth were likely to regularly drink to get high at age 31 as those who did not exhibit youthful delinquency. These findings, then, contradict results supporting the antisocial hypothesis in lower class samples. Instead, they suggest that delinquency among the more privileged classes (itself a rare demographic phenomenon) is linked to later "alcohol problems." This study confuses the issue even more than before by finding no one-to-one link between delinquency (measured by at least one arrest) and later drinking behavior and by uncovering no special link among the more economically disadvantaged.

The last study which we found to have implications for the antisocial hypothesis is important because it dealt with a group of highly deviant children and a large group of "normal" children across a spectrum of social classes. Kandel et al.(1984) studied a high school sample and a sample of absentees from the same schools in New York State; this very large sample was followed up in their middle 20s. Both truancy and dropping out of school were used as independent variables to predict alcohol use, among other variables. For males, neither frequency of use (four or more times in the last week) nor quantity-frequency (five-plus drinks per day in the last month) at last measurement point could be differentiated using absenteeism or school dropout measured earlier. However, school dropout and absenteeism were directly related to unemployment, divorce or separation and cigarette smoking for men. Absentees were more likely to be black, to drop out of school and to have been more delinquent during the high school years. This study–much more representative and larger than any cited heretofore–raises substantial doubts about the antisocial behavior hypothesis. Overall, these diverse findings strongly indicate the hypothesis needs re-examination.

There could be at least three reasons for the differences in findings. First, the operational definitions were different in the different decades the studies were undertaken. After the 1960s, researchers adopted a "problem drinking" approach thereby "liberalizing" the definition to include alcohol-related problems which are not necessarily "alcoholic" or which do not necessarily come to the attention of the authorities in the society. Also, measures of consumption were introduced. If the different conclusions are attributable to operational definitions, a re-analysis of the more recent longitudinal studies should, where possible, recode the dependent variables to make them more consistent across studies. Second, the independent variables in more recent studies may not have properly replicated those of earlier research. Again, this problem can be overcome through use of consistent operational definitions. Third, even with more consistent operational definitions, it may be that the results from the earlier studies cannot be generalized to the later studies because the samples from which the earlier results were derived were not representative of the general population.

In the future, every effort should be made to collectively re-analyze data sets to determine the degree to which and under what conditions youthful antisocial behavior in particular and youthful problematic behavior in general predicts adult drinking practices and problems (measures of alcoholism included). A pragmatic and compelling reason to do so is that antisocial behavior (now called "conduct disorder") has been accepted in the *Diagnostic and Statistical Manual of the American Psychiatric Association* as a predisposing factor for alcoholism, along with other "adult antisocial behaviors." This has far reaching implications for institutions charged with either the prevention or treatment of alcohol problems, among them the possibility that "false positives" may be identified and subjected to intervention measures based on faulty evidence.

A research strategy which simultaneously replicated multiple studies, dealing with different age cohorts, cultures and historical periods, would have many advantages. Because different studies took measures at different ages (with a particularly wide range in the adult years), one could examine *at which* ages the hypothesis is relevant or *the strength* of the relationship throughout the life course under variable cultural conditions. Such an examination would be important given the hypothesis that the chronicity of drinking problems differs according to age (see Fillmore 1985, 1987a,b). Because recent longitudinal studies have shown that drinking practices and problems are age-related within certain cultural groups–contrary to the assumption that alcohol problems, once attained, continue in the adult years–the relationship between antisocial behavior and drinking problems needs to be explored in light of when incidence, chronicity and remission are highest.

Other analyses in a systematic replication effort should try to find out (a) what elements of the antisocial behavior hypothesis, alone or in concert, are contributing to alcohol problems in adulthood and (b) the degree to which the relationship holds up under differing socioeconomic and racial/ethnic contexts.

Since the existing data on the antisocial behavior hypothesis are limited to the 20th Century and to North American and Northern European cultures, it is crucial to determine the cross-cultural generality of the degree to which behavioral characteristics in youth predict behavioral characteristics in adulthood.

THE CASE FOR A GENETIC INFLUENCE ON ALCOHOL PROBLEMS

In the 1970s a group of adoptee studies were used to examine the origins of drinking problems (from Denmark: Goodwin et al., 1973; Goodwin et al., 1977; from Sweden: Bohman, 1978; Bohman et al., 1981; Cloninger et al., 1981; from the U.S.: Cadoret et al., 1980); Cadoret and Gath, 1978; Cadoret et al., n.d.).

These studies tested the premise that a genetic factor promotes the development of alcoholism, a dominant medical, psychiatric and social theme of the turn of the century when heredity was thought to be a cause of many mental disorders, alcoholism included (Bynum, 1984). Theories regarding alcoholism (or dipsomania) were embraced by larger theories regarding mental disorders in general. The "degeneration" view of alcoholism was strongly supported during this period:

> Between 1860 and 1910 almost all the accumulated data seemed to support the general conclusions of the degenerationists. Although it was occasionally pointed out that much of the scientific work on alcohol was produced by those already active in temperance movements, and accepting some version of a degenerationist position, there is no doubt that the bulk of the medical literature of the period implicitly or explicitly embodied many of the causal assumptions of alcoholic degeneration (Bynum, 1984, p. 63).

The influence and popularity of these theories diminished with the work of Pearson and Elderton (1910a,b) and with the growing influence of the Freudian movement. In 1926, Pearl addressed what he regarded as the two divisions in the study of the biology of alcohol–"the racial or hereditary effect of alcohol" and "the effect of alcohol upon the duration of life of the individual" (p. 16). On the first issue, he summarized animal studies which used experimental design and concluded that "The prevalent notion that parental alcoholism tends to cause the production of weak, defective, or monstrous progeny is not supported by the extensive body of experimental work which has been done on the problem" (p. 229). In Pearl's view, introduction of experimental design in the laboratory and employment of statistics in the study of human populations advanced knowledge in the field by critically re-evaluating older assumptions and theoretical perspectives.

There are similarities between the science postulating hereditary links in alcoholism at the turn of the century and today. In both periods, existing data were assumed to prove the thesis: at neither time did a "critical experiment" demonstrate conclusively that a biological basis for alcoholism exists. In contemporary times, the adoptee studies (and, to a lesser degree, twin and half-sibling studies) have laid the groundwork for an explosion of U.S. studies seeking to locate the "biological marker or markers" which might point to this genetic factor. The following statement issued by the U.S. National Institute of Alcohol Abuse and Alcoholism underscores the importance of this research agenda.

> The realization that genetically transmitted determinants and varieties or stages of dependence both play important roles in the disease process of alcoholism has continued to spur the development of research to identify the differences between individuals predisposed to problems with alcohol and those who are not. This body of research has the potential to greatly increase our ability to effectively prevent, diagnose, and treat alcohol abuse and alcoholism, and the Institute continued this year to focus research attention on the heritability of alcoholism (NIAAA, 1986).

Almost 80 years have passed since the hereditary theories were last in vogue. Now they are again beginning to dominate scientific thought on the origins of alcoholism. The re-emergence of this trend, from both scientific and social consequences points of view, requires us to more closely scrutinize the scientific material on which these explanations are based. Noteworthy is that these genetic hypotheses are often treated more as "facts" with the emergence of studies seeking to "find" the "marker."

Schuckit (1985) outlines criticisms of the adoptee studies in the context of genetic research in general. According to him, the findings may be compromised by unknown illness in second-degree relatives and through assortative mating. In the latter case, adults with problems (psychiatric or behavioral) are not likely to mate randomly. El-Guebaly and Offord (1977) conclude also that the nature versus nurture argument is not yet resolved. Although the genetic studies have become more sophisticated, early environmental stress may increase the probability of alcoholism; later alcohol problems may be influenced by "sensory deprivation in childhood, parental separation or rejection, or more subtle disturbances of the parent-child relationship" (p. 363).

We advance these further criticisms. It is assumed that adoptee studies are interested in something called chronic alcoholism or, put more simply, alcohol problems which occur over the space of many years. Chronic alcohol problems, both in clinical studies and in the general population (Armor et al., 1978; Fillmore and Midanik, 1984) are normally found among men in their late 30s and 40s. Interestingly, the ages chosen for follow-up of the adoptee studies are usually not the ages at risk for *chronic* problems, but are the ages in which the incidence, prevalence *and* remission of problems are highest. More than 75% of the adoptive men Goodwin follows up are under 34 at Time 2; Cadoret and his colleagues study adoptees who are between 18 and 31; Bohman and his colleagues measure adoptees who are between ages 23 and 43. Not all of these studies match for age and, importantly, the *chronicity* of problems does not seem to be the issue, rather some measure of "ever alcoholic" or "current alcoholic." This suggests that some of the "alcoholism" picked up by these studies may be transient age-related alcohol problems, not a "syndrome" of problems or a "condition" lasting over many years. This criticism, of course, is applicable to many other studies, including longitudinal ones. However, many studies from the psychosocial framework have explored the transience of alcohol problems in adulthood.

But while the ages studied in this research are not those where chronic alcohol problems are likely to appear either in clinics or in the general population, the point is clear that the probands reported on are found to have a higher rate of alcohol problems than the controls. Unfortunately, most of these studies present extremely limited information regarding the life course of the subjects under study, leaving the interested reader with little or no information on the lives of these people between birth and measurement in adulthood. Even with this paucity of information, potential non-genetic explanations may be found for the differences between the probands and the controls. A description and critique of each of the adoption studies is detailed below.

Goodwin (1979) drew samples from 5,483 non-familial adoptees originally studied by Kety, Roxenthal and Wender (1968) in a large schizophrenia study in Denmark. Three phases were employed in this study:

1. Fifty-five men with an alcoholic biological parent were age-matched with 78 controls. Alcoholism in biological parents was determined by examining central registries maintained in Denmark for alcoholic hospitalization. Alcoholism in sons was determined by psychiatric interview. Sons of alcoholics were four times more likely to be diagnosed as alcoholic as sons of non-alcoholics.
2. The adoptive probands were compared to brothers who had been raised by the biological parents. These brothers, like their adopted siblings, had a higher rate of alcoholism than controls. The severity

of alcoholism in the biological parents was related to the alcoholism in both groups.

3. Daughters of alcoholics raised by foster parents were compared with those raised by alcoholic biological parents and controls. The female samples were small (49 adopted out daughters of alcoholics and 48 controls). There was no relationship between alcoholism in parents and alcoholism in female offspring, although it was found that depression and drug abuse were higher among those daughters raised by an alcoholic parent.

These studies have been criticized because the sex of the biological parent with alcoholism was not always stated, sample loss was above 20% at follow-up and, for the men, two control groups (one whose biological parents had been hospitalized for psychiatric conditions and one whose biological parents had not) were combined (Murray, Clifford and Gurling, 1983). Perhaps the most serious criticism has been against the means by which alcoholism was diagnosed in the adoptees which included relatively infrequent drinking, reports of parental disapproval of drinking and a single traffic arrest for drinking.

> These criteria do not appear very strict but nevertheless produce a curious anomaly. If the cut-off point for abnormality is widened to include not just alcoholism but also problem drinking, then evidence for any genetic predisposition vanishes. Indeed, the control adoptees were more frequently categorized as heavy or problem drinkers than the index adoptees. This finding contradicts the evidence of Kaij's twin study and Cloninger adoption study...that not only alcoholism but also milder alcoholic abuse is under some degree of genetic influence. Furthermore, this finding runs counter to all the evidence that heavy drinking and alcoholism are closely related (Bruun, Edwards, Lumio, Mäkelä, Pan, Popham, Room, Schmidt, Skog, Sulkunen and Österberg, 1975; Royal College of Psychiatrists, 1979). Could it be that Goodwin's findings are simply an artifact produced by the threshold for alcoholism accidentally dividing heavy drinkers in the index and control groups unevenly? (Murray et al., 1983, p.42).

There is an additional potential bias. At the time when these children were adopted, The Mother's Aid in Denmark matched children by social class of biological and adopted father (Jacobsen and Schulsinger, 1981). Other factors taken into consideration were intelligence, educational background and physical appearance. It is posited here that (a) if there is variation in both the biological and adoptive parents' social class and ethno-religious groups, (b) if matching of adoptions occurs on the basis of social class or ethno-religious groups and (c) if alcoholism is more likely to occur in particular class and ethno-religious groups (Armor et al., 1978; Cahalan, 1970), then (d) adopted children from alcoholic biological parents are more likely to themselves be alcoholic, not necessarily as a function of the biological parents' alcoholism, but as a function of the matching of social categories at adoption.

The distinct possibility of a major selection bias can be indirectly examined in this study. As mentioned above, two control groups were combined for the analysis of the males–one a group whose biological parent(s) were hospitalized for schizophrenia (which is most likely to occur in the lower classes, at least in the U.S.–see Hollingshead and Redlich, 1958), the other a group with no evidence of psychiatric illness or alcoholism. However, in the analysis of the female sample, a control group of schizophrenic biological parents was not used. Of the female probands, 18% had adoptive parents with "below average" economic status compared to 6% of the controls, but there were no economic status differences in the male sample. We posit here that the combined use of the schizophrenic (reflective of lower class biological parents) and non-schizophrenic control groups in the male study disguised the social class differences in light of the fact that clear non-random adoption matching took place among the females.

Put another way, we argue that the female children of alcoholic biological parents (who have a higher probability of being lower-class) were matched in the adoption process with lower-class adoptive parents and female children of non-alcoholic/non-schizophrenic parents (who have a higher probability of not being lower-class) were matched in the adoption process with like adoptive parents. This is tentatively confirmed by the economic differences for adoptive parents who fostered female children of alcoholics as compared to those who fostered female children of non-alcoholics/non-schizophenics. Had the male control group *not* included the children of schizophrenics, then a clear social class difference would have been found with lower-class adoptive parents being over-represented among the probands and middle-class adoptive parents being over-represented among controls. Consequently, we hypothesize that the differences in alcoholism between probands and controls would have reflected social class differences rather than biological ones. Had the male control group *not* included the children of non-schizophrenics, then no social class difference would have been found between the adoptive parents of probands and controls. Consequently, we hypothesize that no differences in drinking would have been found. In this respect, the results of the male study may be more related to differences in social class than differences in genetic makeup. Careful matching of probands and controls by social class of adoptive parents would address this issue. Otherwise, we are left with the question posed by Murray and colleagues regarding the combination of the two control groups for the male sample: "Could this have been to increase the likelihood of finding significant differences?" (1983, p. 41).

Other evidence would suggest that the male probands and controls were different with respect to important variables often related to drinking patterns. In the male sample, 38% of the probands were never married or divorced compared to 26% of the controls. While the Danish study provides no temporal order of marital status and alcohol problems, epidemiological evidence has repeatedly shown a relationship between alcohol problems and marital status with the maritally unattached being highly likely to experience problems (e.g. Cahalan, 1970). Further analyses of these data, either controlling for marital status or establishing temporal order of alcohol problems and divorce, would address this problem.

Two major adoptee studies performed by Bohman and colleagues in Sweden are summarized below. The first study did not find differences in the measure of alcohol abuse among children with biological parent(s) with and without alcohol problems. This study sampled children who were candidates for adoption in 1956-57; 93 children were adopted, 118 were raised by the biological mother, and 118 were placed with foster parents (Bohman, 1971). A control group was selected from classmates when the children were measured at age 11. Later follow-ups were at ages 15, 18 (males only) and 23. The aims of the study were twofold: 1. to examine genetic factors in criminality and alcohol abuse and 2. to examine the social processes regarding adoption.

Indicators of alcohol abuse and alcoholism among both biological parents and children were collected from the criminal register and the excise board register for offenses against the Temperance Act. Family type was an important predictor of alcohol problems in the children. Those children adopted and those raised by the biological mother did not differ from controls with regard to alcohol abuse at age 23. However, children raised by foster parents were highly likely to be recorded by the excise board register. The analysts note that there was no relationship between parental alcoholism and alcohol problems in offspring for each of the family types:

> ...cross-tabulation of alcohol abuse among boys and their biological parents did not show a significant correlation in any of the three groups [adopted, raised by biological mother, placed in foster homes]. As alcohol abuse and criminality was common among the parents in all three groups, it is obvious that the boys in foster homes have reacted differently and much more negatively in their social outcome (Bohman and Sigvardsson, 1985, p. 153).

The second study supportive of the genetic hypothesis consisted of a sample of children born in Stockholm between 1930 and 1949 (N=2,324) who were placed for adoption before the age of three (Bohman, 1978). At follow-up (the early 1970s), the children ranged from 23 to 43 years of age. The results showed that male offspring of biological parents who had been registered by temperance boards for alcohol abuse were themselves more likely to be registered. Further refinement of this study matched by age a limited number of male adoptees whose biological fathers were repeatedly registered with the temperance boards with those whose biological fathers were not (Cloninger et al., 1981). Of the probands, 20% showed a history of alcohol problems in contrast to 6% of the controls.

Some information on adoptive parents has enabled these analysts to examine the potential interaction between hereditary and environmental factors, finding that a subset of the children display alcohol abuse associated with both alcohol abuse and criminality in biological fathers, while environmental factors (e.g. occupational status of adopted father) play a stronger role in a larger group.

Murray et al. (1983) have criticized this study for its reliance on temperance board data–data used as the sole source on the extent of alcohol abuse in both biological parents and children. Notably, whether those registered by temperance boards are actually representative of alcohol abusers in the general population is in question. Kaij (1972) has found, for example, that alcohol abusers coming to the attention of temperance boards were more likely to be psychopathic than were alcohol abusers known in the general population who had not come to the boards' attention.

Bohman's study findings indicated that lower occupational status of adoptive fathers was related to severe forms of alcohol abuse by their adoptive sons. Possibly the subculture in which the adoptee was placed is *reflecting* the subculture of the biological father, by virtue of the adoptee selection process, rather than *interacting* with the genetic makeup of the biological fathers.

Children placed for adoption by the Lutheran Social Services in the state of Iowa between 1938 and 1962 were studied (Cadoret and Gath, 1978). The sample, however, was not drawn with an alcoholism study in mind. One-hundred-and-ninety adoptees who had been separated from biological parents at birth (with one or more parents exhibiting psychiatric symptoms) were matched to 194 adoptee controls where there was no evidence of psychiatric symptoms in the biological family. Matching took place on the basis of age, sex, age of biological mother and time in foster care. When the genetic hypothesis among adopted adults was examined in 1982, only 173 of the adoptee pool were age 18 or older. The age at follow-up was a mean of 25.4 for males and 24.8 for females (the range for both sexes was 18 to 40). Sample size was further diminished because 10% could not be located and 40% of the adoptive parents refused to be interviewed. The resulting sample consisted of 127 men and 87 women.

Both first degree and second degree biological relatives were appraised in this study. A "definite" alcohol problem in a biological relative was defined as one recorded by the adoption agency as a "heavy drinker with one or more social, police, work, or medical problems due to drinking, or the individual had been hospitalized for treatment of alcoholism"; a "possible" alcohol problem was defined as a person being a heavy drinker or "as drinking too much for her/his own good" (Cadoret et al., n.d., p. 5). The adoptees' alcohol problems were appraised by interviews with adoptive parents and, in roughly half the cases, through a telephone interview with the adoptees themselves. School records and treatment records, when relevant, were requested from those adoptees consenting to interviews. Definite and possible alcoholism was diagnosed by the Feighner criteria; primary and secondary alcoholism was also specified (Robins and Guze, 1972).

Significant relationships were found between evidence of alcoholism in biological parents and evidence of alcoholism in their offspring for both males and females. Like the Swedish study, the U.S. one examined environmental variables to the extent possible. Antisocial behavior in the adoptive family was unrelated to alcohol problems among adoptees, while alcohol problems in the adoptive family were. Adoptees raised in a rural environment were more likely to have higher rates of alcoholism if there was alcoholism in the adopted family.

This study has been criticized for possibly impressionistic alcoholism diagnosis by adoption agency personnel, the small sample, sample loss, use of parents' interviews to diagnose alcoholism and use of the distinction between secondary and primary alcoholism (Murray et al., 1983). The analysts themselves realized that the sample is young and that selective placement can take place in the adoption process. With regard to the latter, they state:

> In most adoption settings, some matching of adoptee to adoptive family occurs. The most obvious is the attempt to match on physical features as hair and eye color. Other matching also occurs but is less clearly defined and often involves a match based on the 'child's potential'. Possible IQ and social background of the adoptee seem to be elements in this match and determine in part whether a child is placed into an upper social class home with high achievement expectation or a different kind of adoptive home. Such a matching process likely operated in this sample of adoptees yet it is difficult to find evidence for it (Cadoret et al., n.d., p. 18).

It is common knowledge in the U.S. that the adoption process has been traditionally non-random. In some parts of the country, adoptions could not be across religious or ethnic lines. Hair and eye color may be regarded as surrogate variables for ethnic and religious groups, demographic variables highly related to drinking patterns. As with the Danish study, these variables may be confounding the results.

A more serious problem may be related to the ages of not only the children but their parents. The mean age of biological mothers was roughly 21; we may assume that the biological fathers were one or two years older. As the analysts point out, the likelihood of chronic alcoholism being solidly evident at these ages is relatively low. This may mean, then, that the control group's biological parents consisted of a number of false negatives, a problem this group of analysts cannot address with their limited data. Furthermore, the fact that the biological parents were in their early 20s from the late 1930s to the early 1960s warrants attention. During this period, the definition of alcohol problems in U.S. society was in a state of flux as was treatment for alcohol problems. For instance, Mulford (1965) notes significant changes in alcoholism commitments to Iowa State institutions between

1934 and 1965 as well as a major increase in per capita consumption. Younger birth cohorts of biological mothers and fathers may have had a higher likelihood of being described as alcoholic by the adoption agency than older birth cohorts. These potential confounding factors would suggest that future research using this data set match for age of biological parents in an effort to control for differential definitions in alcoholism across time.

The potential confounding factors in these studies suggest the need for caution in interpretation and care in re-analyses. Noteworthy in this work is the lack of integration of other theoretical perspectives and important findings in the contemporary alcohol field. These studies ignore or do not take seriously the many studies of powerful environmental determinants of alcohol problems: for instance, childhood acquisition of deviant drinking and subsequent deviant drinking (Donovan et al., 1983; Jessor and Jessor, 1977), the relative impact of availability of alcohol on individuals' drinking (Wish et al., 1979), the relationship between per capita consumption and alcohol problems in societies as a whole (Bruun et al., 1975) and the effects of economics in reducing alcohol problems on the individual and aggregate levels (Kendell et al., 1983). Because some advocates of the hereditary argument see alcoholism as an either/or concept, the notions of a continuum of alcohol problems and alcohol problems as non-static behaviors tend to be dismissed (e.g. the findings of Cahalan and Room, 1974, on the continuum of alcohol problems in the general population; those of Fillmore et al., 1979, and Roizen et al., 1978, on the sporadic character of drinking problems in the general population; and the findings of Polich, Armor and Braiker, 1981, on the sporadic character of drinking problems among treated alcoholics).

On the other hand, however, few longitudinal studies with a psychosocial framework have examined the biological question of inherited drinking practices. Nonetheless, a few of these types of studies do contain information on parental drinking and they may be used for comparative analyses. At least two demonstrate the importance of assessing parental drinking. Robins, Bates and O'Neal, (1962) found that parental problem drinking was one of a constellation of other parental antisocial behaviors which antedated alcoholism among former patients of a child guidance clinic. In this respect, the inadequacy of parental roles may be of more importance than the way in which the roles are fulfilled (e.g. the presence of parents). Fillmore et al., (1979) found that the frequency of parental drinking and their attitudes toward drinking contributed far more to the prediction of drinking status of respondents in middle age than did other parental drinking problems. This result was even more pronounced when the drinking status of the respondents in youth was controlled. These analysts concluded that the general milieu of alcohol use in the family had an independent effect on the likelihood of respondents exhibiting alcohol problems several decades after they left home.

Because neither psychosocial nor adoptee studies tend to test competing hypotheses, it is recommended here that both types of studies would benefit from analyses developed by representatives of each group working together. The objectives of such an enterprise would include examining the possibility of self-selection bias in the adoptee studies and examining the independent and interactive effects of parental drinking and other early measures on alcohol problems in offspring in the general population. A joint effort, using two distinct longitudinal designs, would better describe the independent impact of parental drinking in general (alcoholism included) on children. The critical importance of such an effort is outlined below.

There is a current explosion of studies to locate the biological "marker" or "markers" implied by the findings of the adoptee and other studies. These studies have been criticized because a persuasive genetic mechanism has not yet been proposed to account for what the state-of-the-art knowledge tells us about social variations and development of alcohol problems and, further, because the genetic models to date over-simplify explanations of human drinking behavior, which is exceedingly complex (Peele, 1986).

The implications of these studies on the social policy, treatment and prevention of alcohol problems should be considered. In the U.S., genetic research has been used to support the disease model–in which biological predispositions are implicated in etiology. Popular notions of the nature of alcohol problems hold that the genetic hypothesis supports the theoretical frame offered by Jellinek (1952) –where the loss of control over drinking among only a minority of drinkers pointed toward a "predisposing X factor."

The current assertions of the "genetic model" also make credible the Alcoholics Anonymous ideology which holds that the response to alcohol is predestined among those who become alcoholic and that "once an alcoholic, always an alcoholic." A genetic predisposition emphasizes the role of victim of a disease, relieving the victim of responsibility for his or her condition. Peele states the following:

> Popular writing and thinking about alcoholism have not assimilated the trend in genetic research and theory away from the search for an inherited mechanism that makes the alcoholic innately incapable of controlling his or her drinking. Rather, popular conceptions are marked by the assumption that any discovery of a genetic contribution to the development of alcoholism inevitably supports classic disease-type notions about the malady. For example, Milan and Ketcham (1983) and Pearson and Shaw (1983) both argue vehemently in favor of a total biological model of alcoholism, one that eliminates any contribution from individual volition, values or social setting (any more than takes place, according to Pearson and Shaw, with a disease like gout). As Milam and Ketcham repeatedly drive home, 'the alcoholic's drinking is controlled by physiological factors which cannot be altered through psychological methods such as counselling, threats, punishment, or reward. In other words, the alcoholic is powerless to control his reaction to alcohol' (p. 42) (1986, p. 69).

If genetic findings are pointing the way to asserting a condition which is not amenable to treatment, then what will the treatment consist of? Chemical means have been suggested (see Peele, 1986). But, notwithstanding scientific discoveries of a workable medical intervention, it is not far-fetched to consider other avenues of intervention.

Diseases or conditions with hypothesized genetic origins–as opposed to those which are "communicable"–may occupy a special place in treatment philosophies under different social and political conditions. During the last century it was suggested by Reid (as quoted by Edwards, 1984) that alcoholics might refrain from marriage. Likewise, Bynum reports of that period: "The only way to abolish habitual drunkenness would be to prevent alcoholics from having children, for a child could inherit an 'alcoholic diathesis,' i.e. a constitution which made deep and repeated indulgence pleasurable" (1984, p. 67). And it was only 40-odd years ago that a "genetic hypotheses" pointed the way to sterilization or liquidation for alcoholics in Nazi Germany (Fahrenkrug, 1987). As Bynum comments in his work on the degenerationist theories at the turn of the century: "Inevitably, we look at degenerationism through lenses the curvature of which is affected not simply by DNA or the 'central dogma', but also by Nazism and concentration camps" (p. 69).

The prevention of alcohol problems under the genetic rubric might take a different form from that which we know today. As mentioned above, a simple but effective means would be to prevent alcoholics from having children in the first place. But should this control mechanism not be employed, children of alcoholics might be given specific attention such as labeling them at an early age and requiring them to remain abstinent. The emphasis on the genetic approach would deflect attention away from considering such factors as the availability of alcohol so that, as Edwards (1984) so aptly put it, it "would be a convenient message for those wanting no meddlesome tampering with the liquor supply."

Much thoughtful work regarding the social consequences of the disease concept has been done (e.g. Conrad and Schneider, 1980; Gusfield, 1983; Room, 1983) but only a few scholars have begun to think about the social implications of a genetic origin of alcoholism. Because this hypothesis and the scientific findings implied by it hold strong potential for supporting racism and determinism in some social and political settings, it is the obligation of the scientific community not only to carefully scrutinize the studies from which these findings emerge, but to insure that they are reanalyzed so that all confounding factors are taken into account.

Longitudinal "Natural Experiments" and the Case for Environmental Forces Changing Drinking Patterns and Problems

A relatively new tradition of longitudinal research, begun in the 1970s, sought to address changes in the environment hypothesized to affect drinking practices. These longitudinal studies contribute to a larger literature–sometimes called the public health perspective. The theoretical framework specifically relevant to the alcohol field on which much of this research rests emphasizes situational factors influencing drinking patterns and problems, above and beyond psychological or biological factors which until the 1960s and 1970s had dominated the field (see Bruun, 1971; Lemert, 1967; and Mäkelä, 1978.) It is postulated that the social control system and the contexts and situations of drinking may be used to explain much drinking behavior. The complicated question being addressed, then, is to what degree can drinking patterns and problems change–either on the individual or aggregate level–if the environment is manipulated or, if there is a manipulation, as such, as a result of the individual(s) being exposed to one versus another naturally occurring environment?

These considerations are ultimately relevant to cross-cultural research. For instance, examination of environmental factors can probe the degree to which industrialization and the emergence of modern complex societies increase or decrease social and psychiatric problems. Voorhees-Rosen and Rosen (1981) summarize this larger question in the context of psychiatric epidemiology and generally conclude that the evidence is not yet in on the degree to which rapid social change affects these problems. They point out that the question is an exceptionally complex one in which social change is potentially interacting with psychosocial and genetic variables with regard to vulnerability.

There have been several critiques of the public health perspective literature in general, particularly on the grounds that the conclusions reached are based on scanty evidence and also with regard to the relationship of per capita consumption and the numbers of heavy drinkers in a given society (Duffy, 1977; Pittman, 1980; Tuck, 1980). Among other problems, this literature has relied on aggregate statistics--a problem which can be corrected by using longitudinal data. However, as will be seen below, the longitudinal studies relevant to this broader literature carry with them their own problems, making conclusions regarding environmental effects less than certain.

Seven longitudinal studies were located which assess environmental change. A pronounced difficulty in all of these is either the absence of control groups or their inadequacy due to "self selection" bias.

The Robins' study (Robins, 1973) of heroin use in U.S. Vietnam veterans is instructive for alcohol use as well. Among other findings, the decreased availability of alcohol in Vietnam and the youthfulness of the subjects could account for a drop in alcohol problems during that time:

> In Vietnam, narcotics were of excellent quality and readily, if illegally, accessible. Legal access to alcohol use was restricted both because many of the enlisted men were under legal drinking age and because Army policy limited liquor purchases by lower ranking enlisted men to beer. By the time of return to the United States, men were over 21 years of age and all types of alcohol were much cheaper and more plentiful than narcotics. Even ignoring the psychological effects of being at war in a strange country, it should not be surprising that the relative popularity of narcotics and alcohol should be reversed under these vastly different conditions of supply (Wish et al., 1979, p. 256)

Veterans' alcohol problems increased at the time of discharge and return to the U.S. and tended to stabilize at that level in comparison to a control group who had not entered the armed forces. The analysts were interested, not only in the Vietnam experience, but in ascertaining the degree to which the "self-selection" process of entering the military was related to the higher rate of problems among this group. In this regard, they selected a sample matched on place of residence, education, eligibility for the draft and age. Even with these similarities, the veterans reported higher rates of alcohol problems and antisocial behavior prior to induction than did controls who retrospectively reported this information.

The problem of adequate control groups is reflected as well in Plant's study (1979) which compared newly recruited manual workers to the brewing industry to controls recruited to a nonbrewing industry. In this case, the recruits to the drink trade were both younger and heavier drinkers prior to their employment than were the controls. While exposure to the brewing industry did increase alcohol problems among this group–which was interpreted on evidence of greater availability and increased peer pressure–the self-selection problem is again a concern.

A Shetland Island study may have been the least affected by this problem, although information is too limited in the reports to adequately evaluate possible differences. Two regions, geographically distinct from one another, were studied. One–target region–was directly affected by the rapidly developing oil industry. Increases in mean alcohol consumption were noted in both regions but particularly in the target zone and particularly among those under age 30. Availability of alcohol and a rise in income were interpreted to contribute to the increase in consumption–the increase in consumption being attributable to increases in frequency of drinking, rather than quantity per occasion. (Caetano et al., 1983). Nonetheless, generalization from this study must be tentative because there are few assurances that the communities were evenly matched with respect to a multitude of characteristics prior to the social change.

A fourth study evaluated the effects of the increase in the price of alcohol in an area in Scotland (Kendell et al., 1983). Although this study reported decreases in consumption and adverse consequences among all drinkers, it did not include a control group. Apart from the methodological flaws, the study addresses the criticisms of the per capita consumption argument–that is, the thesis that alcohol problems in the aggregate tend to follow the rise and fall of per capita consumption (Bruun et al., 1975). The criticism has been that even with social controls exerted on a population, those controls (such as price) would only affect "social" drinkers, not heavy or problematic drinkers (Nathan, 1983). This study observed a decrease in consumption and problems even among heavy and problematic drinkers.

A fifth study evaluated an alcohol abuse prevention program using a naturalistic longitudinal design in a U.S. college setting (Greenfield and Duncan, 1984). Levels of exposure to the multi-component program were confounded by self-selection into various living groups (e.g. fraternities versus dormitories) with widely differing drinking norms, potentially biasing estimates of program impact. These analysts faced up to their complex self-selection bias by modeling the way individual characteristics determine choice of living groups and then using these selection results to adjust the equations for estimating program effects. The analysts regard their findings as most tentative and classify them as a methodological pilot study. However, one finding has relevance to the debate on the extent of environmental influences. They found that an agglomeration of like individuals, rather than direct peer influence, accounted for the substantial differences in living-group drinking patterns.

A sixth study evaluated the impact of roadside random breath tests in one city in New South Wales (Homel, 1986). While the deterrence model was supported in this research, there was no control community.

Last, a quasi-experimental design study compared two Ontario communities, one of which had a new education program (Giesbrecht et al., 1985). Although matching occurred across communities (i.e. on the basis of population distribution by age, low population change, predominantly English speaking, low unemployment and alcohol sales), the Time 1 results report differences in mean alcohol consumption.

The inadequacy of control groups (or their non-existence) increases the complexity and difficulty of the questions this research seeks to address. Often the self-selection and control group problems are unavoidable in this kind of research. These studies don't necessarily reflect poor planning. Rather the researchers are studying social forces rarely under their control.

This type of research suffers from at least two additional difficulties. First, the time between measurement points is inadequate to evaluate the long-term effects of the environmental change. Most of these studies have used a three-year period between baseline and follow-up. The more important question to be addressed is the long-term influence of social change on a population.

While accumulation of social and medical statistics over the long term can partially evaluate changing environmental influences and while the intervention can get lost in other historical changes, the importance of observing new cohorts "born into" the already existing historical change must be addressed. It is one thing to conclude that, at least in the short term, heavy drinkers are decreasing or increasing their consumption, but it is another to suggest that the social change will influence the same persons over the long term or will influence new generations. For instance, younger middle-class birth cohorts during the "Roaring Twenties" in the U.S. were in direct opposition to alcohol controls (Warner, 1970). In this respect, multiple follow-ups over longer periods of time, as well as incorporation of new birth cohorts into these follow-ups, should yield designs which more specifically address the long-term effects of social controls and social change in multiple age cohorts.

Assessment of long-term effects have immediate practical significance in terms of contemporary prevention frameworks which seek to curtail the availability or access to alcohol. If only short-term effects can be demonstrated, as has been true for a number of interventions–such as harsher DWI laws where enforcement was less than fully practicable–these policies must be subject to renewed consideration.

Second, these studies could integrate variables from other disciplinary frameworks which might include psychiatric or genetic "vulnerability." Although this information would most likely be retrospective in nature (e.g. the presence of a family history of alcohol problems), it could add to an understanding, above and beyond demographic characteristics, of who is more likely to be affected by social change or environmental manipulation. While Robins' study did include such questioning, the analysis regarding drinking change as a "function" of the hypothesized predisposing factors was not performed (Goodwin, Davis and Robins, 1975).

Regardless of these problems, the accumulation of this type of research should enable the interested scholarly community to begin to disentangle the effects of social change on drinking behavior. Toward this end, scholars engaged in "natural experiment" or quasi-experimental longitudinal research should develop some common instruments so that results across studies can be used for very rough comparisons. The same recommendation is applicable to repeated sampling designs concerned with environmental questions. It is also recommended that the burgeoning econometrics literature on the ways of handling selectivity problems be consulted (Barrow, Cain and Goldburger, 1983; Maddala, 1983; Muthen and Joreskog, 1983).

The major recommendation regarding the potential contribution of longitudinal studies to this literature is not confined to those studies which were designed to evaluate social change or natural experiments. If the weaknesses of the trend or repeated measurement studies and the weaknesses of the longitudinal studies which have been used to assess the public health perspective hypotheses are taken into account, it is obvious that the recommendations above are *not* sufficient to adequately generalize from this body of research for many years to come. We propose an analytic scheme which will more clearly, albeit not perfectly, address the impact of cultural, historical and economic conditions which hypothetically change the nature of drinking patterns in the general population on both the aggregate and individual levels.

It would be possible to use many of the longitudinal studies for purposes other than for which they were originally designed. Because we know that the prevalence of heavy drinking and alcohol problems varies historically and cross-culturally and because it is hypothesized that this variation is at least partially a function of differing social and economic conditions, it would be possible to reconstruct the social and economic conditions of the periods in which many of the existing longitudinal studies were performed. Doing that, studies could be used as "controls" for each other (e.g. where price remained constant but income varied across studies).

While this analytic scheme would not be one where causality is implied, it would serve as a descriptive step toward more systematically delineating the conditions under which incidence and chronicity of levels of consumption and alcohol problems are likely to change. In turn, the analyses would provide a set of guidelines for future data collection where environmental and social factors are hypothesized to influence drinking patterns.

Last, the scheme would integrate two quite disparate bodies of research–research traditions which have often been used in "critique" of each other. By considering "maturational hypotheses" and cultural, economic and political hypotheses within the same research framework, the relative power of the two explanatory frameworks could be assessed in a competitive manner.

The "natural experiment" studies are in their infancy and therefore major problems are encountered in generalizing their results. Nevertheless, they sharply remind longitudinal researchers of the importance of history as a component which may change the direction of the drinking practices of a population. Rarely are traditional longitudinal studies even couched in a discussion of the social changes taking place in their subjects' environment as a whole, not to mention social, economic or political trends in the period under measurement. At the very least, future longitudinal research should document the history of social change which may have affected selected cohorts or the entire population of those under study.

There are clear social consequences implied by the studies performed under the public health rubric. Because they suggest prevention in the form of manipulating the environment by reducing the availability of alcohol or increasing the cost of alcohol (among other efforts), they may run the risk of interfering with people's civil rights. In this sense, it is important to more carefully assess both the short-term and long-term effects of environmental manipulation in replicated research designs.

CONCLUSION

Three themes of findings from the alcohol-related longitudinal literature were examined in depth, each representing distinct explanatory frameworks of drinking patterns and problems. Each has methodological weaknesses, self-selection problems and control group problems. But a greater flaw is that each of the explanatory frameworks has paid little attention to testing competing hypotheses, and none has attempted to systematically test their findings cross-historically, cross-culturally or across birth cohorts. By attempting to test competing hypotheses and systematically replicate findings the value of longitudinal research–a design which most closely can deal with issues of causality–will be greater.

Chapter 5.

DISCUSSION AND SUMMARY OF RECOMMENDATIONS

Most reviews of the literature pull together existing studies, deciphering from them a common thread or "story line" to "explain" particular phenomena. In the introduction to this report, it was pointed out that this was a review of a method which touched on multiple research questions in the alcohol literature. This necessitated writing a number of story lines. Rather than trying to unravel each thread in this rather large body of research, the history of the alcohol-related longitudinal literature was chronologically related to see where we, as scientists interested in the relationships between human beings, alcohol and time, have been and in what directions we are going. As well, we can see what data we have at our disposal to more carefully address specific research questions across individual studies.

This review has also made recommendations for future research. Usually such reviews recommend new data collection and new research designs. While some of the recommendations in this report suggest new research projects, we have also looked back, in the hope that what we have at this point in time might serve a useful scientific purpose.

The major recommendation to emerge from this review entails a research scheme or schemes to synthesize and critically compare findings from 70 years of alcohol-related longitudinal research. It is based on four important considerations.

First, a great many of the longitudinal research projects have not recognized their own potential. Many of them reported their data before computers and/or advanced statistical techniques were widely used. Others contain valuable data which have never been analyzed, some of which could test competing hypotheses which are central to contemporary thinking regarding alcohol use and abuse. Still others examine the same research questions in quite different historical or cultural contexts but their findings have never been systematically compared.

Second, existing longitudinal studies cover a diversity of ages in the life course. This means that systematic comparison can assess the degree to which relationships are unique to ages of measurement and can provide description across the life course.

Third, a careful reading of this literature sheds an interesting light on what we measure when asking about the "predictors" of drinking styles or the drinking styles themselves. Longitudinal studies have not been overly creative in posing unique questions. Regardless of the theoretical frameworks, basically the same questions are asked over and over again (e.g. how much and how often drinking takes place; where, when and with whom; what problems are encountered when drinking; age, sex, social class). This means the studies could be replicated or undergo meta-analysis. And, importantly, such analyses could address three very important confounding factors in any scientific inquiry by comparing results cross-historically, cross-culturally and across birth cohorts within given societies.

Fourth, to carry out research syntheses like the ones proposed here in future research projects would require at least half a century of new data collection on new birth cohorts and multiple historical periods and cultures. Although some of the existing data sets are limited and have major methodological flaws, many of the longitudinal studies reviewed here are of the highest scientific caliber where every care was taken to adhere to scientific methodology. This rich history of a longitudinal research should not be ignored in its potential to investigate the same research questions using a coordinated research frame-work.

Essentially five questions have been posited as important for such a coordinated design, not the only ones which could be asked but ones central to contemporary thinking in the alcohol field. We restate the questions and specify the scientific and pragmatic contributions an assessment of them would make.

1. Do the prevalence, incidence and chronicity of drinking patterns and problems vary according to age and sex, independent of the effects of birth cohorts, historical periods and cultures? Synthesis of findings from multiple longitudinal studies can provide basic epidemiological description over the life course. Equally important, the descriptive findings from individual studies can be replicated by

comparing those at the same ages of measurements. Doing this would indicate the ages at which the highest incidence and the highest remission occurs, thereby facilitating alcohol-related health planning by pinpointing when in the life cycle intervention and prevention efforts would be most effective.

2. While the first question addresses a biographical or maturational hypothesis, the second addresses a cultural one–one suggesting that age's salience and strength as a descriptor of drinking patterns is contingent on cultural settings and environmental factors. Do environmental factors (e.g. social, economic and political factors) influence drinking patterns differentially by age and sex? Longitudinal studies not originally designed to examine this question could be used for comparison in different cultures and historical periods. Such analyses would benefit public health policy by pointing to the economic, political and social conditions under which specified drinking patterns and problems increase and decrease and which ages/sex in given societies are most affected.
3. Do changing social, psychological or biological factors within particular age strata across studies initiate or alter problematic drinking careers? Cross-study examination of the exogenous factors which initiate and alter drinking careers within specific age groups would provide a means of identifying those who began to drink in a problematic manner and those who continue to have drinking problems. These are important analyses to examine among adolescents and young adults, where discontinuity of drinking problems in U.S. studies is found to be high but where, also, high prevalence of alcohol problems can be found. It is equally important to examine after middle age where remission of alcohol problems has been documented from cross-sectional and longitudinal research, particularly in the U.S. Such analyses could determine the degree to which morbidity and mortality contribute to these findings. Last, competing hypotheses from differing explanatory frameworks could be examined.
4. Can adult drinking problems be predicted on the basis of a sociobehavioral model (where measurement first took place in childhood or adolescence) across cultures and historical periods? Cross-study examination of antisocial behavior in youth would reveal the degree

to which these behaviors could be generalized as antecedents of adult drinking problems. Replication across studies would clarify the confusion and contradiction in the contemporary longitudinal literature regarding these postulated relationships and would inform public health interests.

5. Will the hypothesized intra-generational genetic link between alcohol problems in parents and offspring be confirmed in adoptee longitudinal studies after making statistical adjustments for possible self-selection bias and can general population studies add to our understanding of the impact of parental drinking practices on offsprings' drinking by bringing other factors to bear on the question? If inter-disciplinary teams worked on these questions, two longitudinal research areas (psychosocial and genetic) could more carefully test competing and interactive hypotheses. To date, these areas have not been effectively integrated because of disparities in research aims.

Reassessment of this important literature to examine the relationship between age and drinking–biologically, socially and psychologically–would reflect the inter-relationships between maturation and development, culture and historical period.

Planned and new longitudinal data collection should ensure that culturally distinct groups are studied, that both sexes are sampled and that some studies measure in depth the middle and later years of the life cycle. It is also recommended that multi-causal hypotheses be incorporated and tested in such research.

The role of longitudinal research in the alcohol field has been a powerful one. No other study design can better paint a potential causal picture. The studies have challenged old assumptions and findings and have paved the way for new. Their research findings have resulted in divergent scholarly and practical approaches to alcohol problems. They are ultimately worthwhile in their potential for understanding human behavior in the context of time and for suggesting strategies which may alleviate much human tragedy.

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